SUBCONTRACTING IN TELEVISION INDUSTRY
A Case Study of Keltron's TV Factory and its Small-scale Subcontractors

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I hereby affirm that the research for this dissertation titled "Subcontracting in Television Industry -- A Case Study of Keltron's main TV factory and its small-scale subcontractors" being submitted to the Jawaharlal Nehru University for the award of the Degree of Master of Philosophy was carried out entirely by me at the Centre for Development Studies, Trivandrum.

Trivandrum.

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Certified that this dissertation is the bonafide work of Sri A.J.C. Bose and has not been considered for the award of any other degree by any other University. This dissertation may be forwarded for evaluation.

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C O N T E N T S

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CHAPTER I

INTRODUCTION : REVIEW OF LITERATURE AND SCOPE OF THE STUDY

> " Subcontracting has become a major industry in its own right. No firm can afford to ignore the opportunities for placing work on sub-contract, or for obtaining such work on favourable terms. The sub-contract network is often widespread and complex. Its efficient management is vital to economic manufacture."
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> -- "Profiting from Sub-Contracts", North-West Industrial Review (England), Vol.11, No.2, April 1979 cited in L.R.Upasani, "Subcontracting: to foster the growth of small industries", Productivity, Vol.15, No.4, January-March, 1975, p.438.

The Concept: Subcontracting:

There is no consensus in the literature on the connotation of the term, subcontracting. The concept has assumed different meanings to different people. For some, there is subcontracting" whenever a product being marketed incorporates parts that have not been manufactured by the firm selling the product or has operations required in its manufacture that have been undertaken by other firms."[1]

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1. See UNIDO, Subcontracting for Modernizing Economies, (UN, New York 1974) p.45.

This indeed is a very broad definition; it fails to differentiate between ordinary purchasing and specialised procurement on the basis of contractual relationships.

The concept of subcontracting is more often used to connote a contractual relationship between two firms -- the 'subcontracting-out firm' and the 'subcontracting-in firm'. The bond between supply and demand linking these two firms is direct. The 'subcontracting-out firms' are variously known as parent firms, main firms, contractors, customers or clients, principals and primary companies. And the 'subcontracting-in firms' are known as subcontractors.[2]

The 'subcontracting-in firm' does work that conforms to the specifications of the order set out in advance by the 'subcontracting-out firms'. As such, the supplies from the 'subcontracting-in firm' are specialized or proprietary goods; they are meant for definite customers. In fact, in its narrow sense there is subcontracting if and only if items are bought-in from suppliers subordinated to the customers' technical, economic and managerial control as regards specifications, working methods, production schedules, inspection standards etc.[3]

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2. They are also known as child companies, satellites, feeder units, jobbers, vendors, suppliers, ancillaries. These terms are all more or less used as synonyms. But terms like 'vendor', 'supplier' and 'ancillary' are much more elastic than 'subcontractor'.

3. UNIDO, Op.cit.p.45

Thus viewed, 'subcontracting' is a method of organisation of production based on technical and social division of labour, and specialisation as against 'vertical integration' under which, a single firm or business unit carries on the entire production of an end-product.

Semantically, 'contracting' and 'subcontracting' are often used interchangeably. To illustrate, consider an end-product manufacturing firm, say, in motor industry. The work it farms out directly to a second firm represents 'contracting-out work'. And the work off-loaded by the second firm to a third firm is 'subcontracting-out work'. But the work done by the second firm is 'subcontracting-out work' in so far as the first firm does not sell the end-product unit-by-unit but sells in large blocks on contract to big customers like government agencies or transport firms[4].

The terms 'subcontracting' and 'supplying' are also sometimes used as synonyms. But they can be sharply distinguished. A supplier may not only produce an intermediate or related product on subcontract to cater to the requirements of original equipment manufacturers (OEMs) but also sell it as a spare for replacement of the original equipment.

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4. See Andrew Friedman, Industry and Labour Class Struggle at Work and Monopoly Capitalism, Mac Millan, London, 1977, p.119.

suppliers producing solely for the replacement market are not considered 'subcontracting-in firms'[5]. Also, a supplier is not a 'subcontracting-in firm' when it makes standardized parts and components for incorporation into original equipments.

For analytical study, the complexity of defining subcontracting relationship is accentuated by the nebulosity of the concept of the firm itself[6]. A multi-plant firm is said to be vertically integrated when such a grouping is bound together by legality in terms of common source of finance or common ownership and when such a grouping's productive activity is co-ordinated by the managerial plans and administrative arrangements of the larger or parent firm of the grouping. However, it can be argued that the essence of a firm is not the legal connection but the co-ordination of managerial planning[7]. Thus, if there exists a system of division of labour and specialization in relation to an end-product manufacture within a multi-plant firm, and the parent firm of the grouping acts as the 'system organiser',

5. However, they are 'subcontracting-in firms' when they supply spares to OEMs on the basis of "firm orders" from the latter.

6. That is, there is no consensus about what constitutes a firm. While it is easy to identify the unincorporated single-ownership, the partnership, and the small corporation without subsidiaries, it is not so in the case of the large corporation with many subsidiary-plants and associate-plants in the modern business world ridden with extensive and elusive lines of control or influence.

7. On this important point, see Edith T.Penrose, The Theory of the Growth of the Firm, Basil Blackwell(Oxford:1968) pp.20-21. A corollary of her argument is that if any of the subsidiary-plants operates independent of the managerial co-ordination of the parent firm, then it should not be classed as part of the parent firm despite the legal connection.

then there is 'intra-firm subcontracting' despite the legal connection of the subsidiary-plants with the parent firm. As against this, if legality (via stock ownership) is seen to be the essence of a firm, there is no intra-firm subcontracting. There is 'inter-firm subcontracting' if and only if the subcontractor is legally independent of the parent firm.

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However, the legal autonomy of subcontractors does not always ensure them against loss of technological, economic and even managerial autonomy. In other words, in most cases, even if they are not controlled by financial holdings, they do not form independent capitals from the parent firm's production functions in an integrated series. They do not decide on the quantities they produce. Similarly, the prices at which the quantities are exchanged are transfer prices imposed on them; they are not market prices. Moreover, their commercial viability and future is ultimately dependent on the vicissitudes of production planning and financial soundness of parent firms. In short, " their dependence is set by technico-economic norms over which they have no influence"[8].

From the foregoing exposition, we may for the purpose of the present study define loosely 'subcontracting' as a

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8. Michel Aglietta, A Theory of Capitalist Regulation The US Experience, New Left Books (1979) p.220; An inference here is that the only adjustment the subcontractors are capable of making is with respect to the exploitability and expendability of their labour.

method of organisation wherein a 'subcontracting-in firm' does the following types of work according to the technical parameters and design specifications of the order from a 'subcontracting-out firm' : (1) Production of materials, parts and components or (2) performance of any subassembly/ assembly or (3) any processing or (4) any service or (5)even manufacture or final assembly of an end-product.

Industrial structure and subcontracting

It follows that subcontracting is a co-operative relationship in that it is apparently based on the interdependence or mutual interests of the parent firm and the subcontractor. Terms and conditions of this complementary relationship are, however, fixed by relative power[9] (bargaining strength) which is determined by such factors as size, market power, technological sophistication, specialisation and the consequent 'fitness for purpose', product and market specificities etc.

The character of subcontracting is said to be usually asymmetrical because it takes place predominantly as a 'centre-periphery' power relationship[10] between large or medium-sized

9. The point that mutual interests and relative power are two distinct elements in both the organizing and structuring of productive relationships is made by Frank Wilkinson,"Productive Systems", Cambridge Journal of Economics,1983,7,p.417. He draws an interesting analogy between inter-firm power relationship via subcontracting and the power relations between labour and capital in production. Just as labour is inherently inferior to capital and much more immediately dependent on capital, so also is the subcontractor vis-a-vis the parent firm.

10. The use of 'centre-periphery' notion is very elastic; there is centre-periphery within a firm in that certain employees are considered 'central' and others 'peripheral'(i.e.expendable). It is used to refer to developed and underdeveloped regions within a national frontier. It is also used to denote the unequal relations between industrialized and industrializing countries.

and several smaller firms. However, there do exist situations of subcontracting between large and large, small and small, and between small and large firms.

Large parent firms may seek outside work in order to justify economically the continued operation of their in-house facilities such as foundry, forge, machine and plating shops. The phenomenon of medium-sized or small parent firms subcontracting to other small factories is considered sometimes as a lasting and more often as occasional, jobbing arrangements. This could happen, for example, when medium or small firms usually take on orders which, either in volume or in the type of processes or machinery and equipment needed, are beyond their in-house capacity, and so they resubcontract the orders in part or full to other small parties[11].

Small parent firm-large subcontractor relationship could happen "when small firms send products for finishing to the plating division of a large enterprise or order castings from the foundry of a big firm"[12]. It could also occur in activities "such as processing of raw materials in saw mills, planing mills, leather-tanning plants and stone cutting, where the material is provided by and returned to the contractor.... In this case, there are usually more contractors than subcontractors, and the latter enjoy an unusually strong competitive position and do not need assistance from other sources. This, however, is not typical"[13]. Further, when

11. UNIDO, Op.cit.pp.23,51.
12. ibid.p.51
13. ibid.p.23

subcontracting happens between firms of roughly the same size, the subcontractor is considered to be usually diversified in terms of product lines as well as clientele[14].

In short, "the industrial structure is so complex today in developed countries that many firms, large and small, seek as a policy to be both contractors and subcontractors."[15] This complexity also exists in some developing countries.

Typology of subcontracting:

In terms of characteristics, several types of subcontracting can be distinguished. One is 'industrial subcontracting', where the work the subcontractors do, enters as intermediate products or processes within the parent unit's broader production process. In contrast, there is the 'commercial subcontracting', where the parent firm is a trading firm; it contracts out the production of a whole product and sells it as its own[16]. A mix of the two types is also prevalent. That is, there are manufacturing firms which behave like trading companies, and there are trading firms which undertake the finishing or further processing operations. Another type of subcontracting is the "labour-only subcontracting" ("contract or subcontract labour system"). The parent firm employs workers alongside

14. ibid.p.23
15. ibid.p.51
16. This typology is owed to Susumu Watanabe, "Technological Linkages between Formal and Informal Sectors of Manufacturing Industry", Working Paper 34, Technology and Employment Programme, WEP 2-22, ILO (Geneva : 1979),p.11

(or at the cost of) its regular workers through outside subcontracting companies or hiring agents or through inside 'central' workers. The workers so employed perform auxiliary or even mainline tasks at the plants of the parent firm. Such subcontracting operates as a labour rationalisation scheme whereby the parent firm seeks to reduce labour costs, engineer easy lay-offs, break the organised power of the regulars, pass on dangerous work etc.

In form, three subcontracting varieties can be distinguished: economy subcontracting, specialized subcontracting and capacity subcontracting. The distinction is made on the basis of the main motivations of the parent firm.[17] However, they could and do overlap in reality.

In economy subcontracting, the motivation of the parent firm is to take advantage of the relatively low costs of the subcontractors originating from the latter's low labour costs, low overhead and administrative costs, and considerably lower profit margins. The assumption here is that the labour productivity and quality efficiency of the subcontractors are not so low as to atrophy the wage differential advantage. In the process, the parent firm avoids capital investments for uneconomical manufacture of several types of components and parts it requires in small batches.

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17. See UNIDO, Op.cit.pp.46-51.

According to UNIDO, even in conglomerate enterprises (i.e. multi-product, multi-plant, giant firms) which maintain in-house facilities for every item up to a certain capacity, the trend "is increasingly to permit the managers of individual plants or product divisions to decide whether to produce within the firm or to subcontract out... This policy is usually followed not merely to give an adhoc cost advantage on the basis of the figures of alternative costs but rather to ensure that over the long term, all facilities within the firm will be used at competitive production costs. In this case, economic subcontracting is a means of forcing all production units to be constantly efficient and competitive".[18]

In specialized subcontracting, the parent firm depends on the specialized machinery and equipment or specialized technologies or innovative capabilities of the subcontractors in activities that are mostly dissimilar to its own.[19] It also depends on large-scale suppliers specializing and deriving economies of scale in the manufacture of interchangeable, standardized parts and components which are cheaper to purchase than to produce in-house.

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18. ibid.p.47

19. For example, in engineering industry there are specialist jobbing firms in activities like foundry work, forging, heat-treatment processes, plating and metal finishing, specific machine operations, production of tools or high precision parts (even on 'one-off' basis) etc., which are still largely based on the high manual skills of workers and technicians.

In capacity subcontracting, the parent company finds its production capacity insufficient to meet the delivery schedules of the normal flow of orders, and hence the dependency on outside capacity. A variant of this is 'peak-load' subcontracting due to sudden surges in the order books. Capacity subcontracting can also arise due to "unforeseen factors such as labour disputes, escessive absenteeism, machine breakdown, defective materials or just bad planning resulting in far too optimistic production estimates"[20]. It may also emerge when, due to fierce competition, the ability to meet quickly delivery schedules is more crucial than price or even technical competence. Therefore, parent firms may "deliberately take on far more orders than they can handle with their own capacity or quote early delivery dates to obtain a particular order, relying on subcontracting to enable them to fill the orders."[21] There can also be a situation of 'marginal subcontracting', when the orders are too small or infrequent to justify in-house production. Capacity subcontracting can also emerge as a substitute for expensive overtime work or night shifts or set-up operations. Thus, capacity subcontracting merges with economy subcontracting. Further, capacity subcontracting is found to be the most intermittent of all subcontracting forms, thereby making the atmosphere for the smaller subcontractors highly volatile and uncertain.

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20. ibid.p.49

21. ibid.p.49

There is also a basic distinction made between 'domestic subcontracting' and 'international subcontracting'. The meaning, types and forms of subcontracting as discussed above hold good in both cases. The difference is that subcontracting extends itself spatially first in domestic economies and then on an international scale. Further, both cases could develop as 'spontaneous' and/or 'compulsory' (or 'enforced') and/or 'encouraged' subcontracting according as the degree of intervention by governments and various international bodies (e.g. the World Bank), and the role played by international subcontracting exchanges that are linked to domestic and regional subcontracting exchanges[22] or industry associations within countries.

International subcontracting relationships exist not only between market-industrialised and industrializing countries but also between 'socialist' countries, and between 'socialist' and industrializing countries.[23] Also,

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22. Subcontracting exchanges, domestic or international, work to match demand for and supply of subcontracting. Thus, they help utilize competent idle capacity; they make possible a multi-directional traffic of work and facilities and thereby enhance the overall productivity of the operating orbit. For details, see ibid.pp.85-103 and passim.

23. Thus, international subcontracting also works as "transideological means of industrialization". It happens as an 'instrument of industrial co-operation' and as a search for low wage countries for labour intensive activities and also as a means of overcoming the problems of labour shortages in 'socialist' countries. See A.Kalliantzidis, "La sous-traitance internationale en tant que moyen de development: comparison des pratiques Est-Ouest", roneoed thesis, IEDES /University of Paris, 1978 pp.101-105, 123, cited in Dimitri Germidis, "International Subcontracting and Industrialization of the Third World: Problems and Perspectives" in Dimitri Germides(ed)., International Subcontracting A New Form of Investment, OECD (Paris:1980)pp.17-18.

attempts have been made by governments to foster international subcontracting on broad regional (economic integration) basis.[24]

The parent firms in international subcontracting are interchangeably referred to as international firms, transnational firms and multinational firms, especially of American, West European and Japanese origins.[25] The subcontractors in international subcontracting could be

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24. As an example, an intra-ESCAP plan of complementation and subcontracting in electronics industry would involve division of labour and specialisation in the production of high purity raw materials, components, sub-components, subassemblies (modules) and sharing specialised manpower, resources, institutions leading to product development, prototype work and applications technology. But the final assembly, fabrication and packaging would be done locally within each country. See "Report of the Seminar on Subcontracting and Complementation in the Electronics Industry in Developing Countries of ESCAP Region", in Electronics Information and Planning, Vol.10, No.6, March,1983.

25. A growing number of trading (wholesale and retail) transnationals are "organised from the consumption side in relatively loose-knit international systems with varying memberships. The leading enterprise is chiefly responsible for marketing, product design, planning and organising; perhaps also for financing, but with a limited involvement of its own capital... To a large extent these enterprises evade the sensitive question of proprietary control of the subsidiary companies in the developing countries...(They)....are also able to adapt quickly to new market-conditions.. The liquidation of less profitable products can be achieved by serving links with various independent enterprises". See Lars Anell, Recession The Western Economies and the Changing World Order, Francis Pinter Ltd.,(London:1981) p.83; It has also been observed that the Japanese trading companies organise triangular trade by establishing joint-ventures in low-cost-of production centres with the objective of exporting most of it to third countries. See Kosmos Tsokhas, "Social Capital, Interdependence and Japanese Multinationals", Journal of Contemporary Asia, Vol.11,No.4,1981.

foreign 'workshop subsidiaries' (that export completely to the parent firm), foreign 'relay subsidiaries' (that export or sell in the country in which they are located), joint ventures, independent foreign enterprises (in developing countries) and independent developing economy firms.

The actual circuitry of relationships between parent firms and subcontractors in international subcontracting has not been easy to grasp.[26] Also, the definition of international subcontracting has been a bone of contention. There is no consensus as to whether the emphasis is on corporate structures or geopolitical boundaries or techno-economic-managerial control. In general, there is no problem in treating international subcontracting as "all exporting sales of articles, which are ordered in advance, and where the giver of the order arranges the marketing."[27] However, some scholars[28] do not recognize sales by transnational subsidiaries to their parent firms as based on subcontracting relations; they are treated as transactions within transnational corporations vertically integrated on an international

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26. On attempts at classifying the circuitry, see Charles-Albert Michalet, "International Subcontracting: A State-of-the-Art" and Claude Berthomieu and Anne Hanaut, "International Subcontracting: The case of Morocco", in Dimitri Germides(ed.), *op.cit*.pp.50-54,117-118; Also see APO, *International Subcontracting: A Tool of Technology Transfer*, Tokyo 1978,p.3-4.

27. This is the definition in the seminal paper by Michael Sharpston, "International Subcontracting", *Oxford Economic Papers*(New Series), Vol.27, No.1,March 1975 p.94.

28. For instance, see Susumu Watanabe, "International Subcontracting, Employment and Skill Promotion", *International Labour Review*, May 1972.

scale. However, sales to transnational subsidiaries by local firms within a national frontier are included in the definition. Clearly, legal autonomy does not necessarily mean techno-economic autonomy, and therefore, the legal criterion fails to explain the real meaning of the subcontract relationship -- domestic or international.[29]

Necessary condition for subcontracting

Subcontracting of the 'industrial' type does not emerge and develop in all industries in modern times. Whether subcontracting possibilities exist or not cannot be answered without identifying the type of the industry, the nature of the product, its intermediate products or production operations or processes and the specific manufacturing systems (like 'unit', 'batch' and 'mass' or 'flow' systems) adopted.[30]

In process industries, the 'dimensional' products are measured by weight, capacity or volume. In the process of

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29. The definitions by UNIDO, OECD, UNCTAD and several writers such as Sharpston, Germidis etc., recognise transnational intra-firm trade as international subcontracting.

30. This study is concerned with sub contracting in manufacturing sector only. Subcontracting in agri-business, construction industry (excluded from manufacturing), services industry etc., is beyond its scope.

production, there occurs not only a chemical change within the process but also physical one; the structure of the material changes at the molecular level. Such production, in many cases, is a continuous flow and has inherent economies of scale[31]. The successive stages of the process cannot be broken in time and place; they are integrated within a plant and are operated often twenty-four hours a day involving shift-work. The plant is shut down only for major maintenance, may be once in a year. The important point is that in such production process, "quality control becomes crucial and merges with control of the process rather than control of the product- by the time the quality of the end-product has been tested, many hundreds of tons of it may already be in the process stream or have passed through it, e.g. in an oil refinery or steel mill."[32] Thus, there is no scope for

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31. The inherent economies of scale, for example, in chemical industry are explained by the 'six-tenths rule' which states that the relationship between cost and scale is analogous to the physical relationship between surface and volume. See C.H.Chilton (ed.), Cost Engineering in the Process Industries, McGrawhill, New York 1960 cited in Raphael Kaplinsky, "The International Context for Industrialization in the coming decade", The Journal of Development Studies, Vol.21, No.1, October, 1984, p.81; The rule is stated elsewhere as follows: "As a physical fact, if the volume of some vessel or container is increased to the cube of itself (i.e. a volume is increased to x^3), the area enclosing it is increased only to the square of itself (i.e. an area y is increased to y^2). If the output capacity therefore depends on the volume while cost depends on the area, then cost increases less than proportionately to output." See G.Bannock, R.E.Baxter and R.Rees, A Dictionary of Economics, Penguin 1972, p.136.

32. On this point and process production's characteristics as stated above, see G.Clews and R.Leonard, Technology and Production, Heritage Publishers, 1985, pp.23, 95; According to Woodward, certain chemicals and oil refining are produced intermittently in multi-purpose plants; there is scope for breakdown of work in such production. We may infer from her findings that such breakdown could lead to subcontracting rotations between firms. See Joan Woodward, Industrial Organisation Theory and Practice, OUP, 1980, p.179 and passim. She points out that in batch or intermittent production, work could be broken down on the basis of the type of operation or type of product or component or even the type of material handled.

subcontracting of the 'industrial' type.

By contrast, there are no inherent scale economies in manufacturing industries producing 'discrete' or 'integral' products. Scale economies are remarkably affected by the 'downtime' (i.e. the amount of time a machine is not available for production) involved in re-setting machinery specification from one size or type of product or component to another[33]. As such, production in these industries "had tended to bifurcate between dedicated, mass production (e.g. Henry Ford type assembly lines) and small or medium-batch production in which differential - final demand does not allow for the economies of mass production to be realized."[34]

Also, the discrete-product industries are usually those industries undertaking assembly or discrete(dissimilar) processing operations or whose output can easily pass through a number of stages under a number of different roofs. Produ-ction process can be fractionalized into different technical phases. Separate firms can produce numerous parts and components in different quantities requiring different manu-facturing systems. And the various individual items are assembled elsewhere to get the complex end-product. Notable, especially in electronics, is the development of modular design whereby a product is decomposed into basic modules, each being a composite unit of various sub-modules or

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33. ibid.p.105
34. Raphael Kaplinsky, op.cit.p.82

subassemblies of parts and components. Production is not affected by the physical separation of production sub-processes. These industries also comprise industries where raw materials and goods are light-weight and so are transportable easily and industries wherein the more finely fragmented the production, the easier it is to exploit unskilled labour.

Subcontracting -- Difficult to study empirically

Subcontracting relations are difficult to quantify for various reasons. There is the definitional problem. Besides, documentation of subcontracting has not been meticulous in general. Much of subcontracting activity takes place in the unregistered, underground/sweatshop economy, largely orchestrated by larger firms in the mainstream economy. It is difficult to differentiate domestic and international subcontracting because capital ownership-type of the parent firm is not always specified, and much of the subcontract-order-flow is not straightforward. Furthermore, in some countries, subcontracting relations are protected by high confidentiality granted by law.

The general failure of official statistics and the other problems[35] are, however, compensated by investigative

35. Japan is an exceptional case. There, subcontracting is documented well and appears in official statistics, supplemented by branch-specific and case studies. For instance, see Rob Steven, "The Japanese Bourgeoisie", Bulletin of Concerned Asian Scholars, April-June 1979; Richard E.Caves and Masu Uekusa, Industrial Organization in Japan, The Brookings Institution, Washington D.C.1976; Mitsuru Yamazaki, Japan's Community-based Industries: A case study of Small Industry, Asian Productivity Organization 1980.

research on the economics of subcontracting, its profitability and its operation. All over the world, the '70s through early '80s have witnessed a boom in branch specific and case studies on subcontracting. A brief review of this literature would be relevant to bring into focus the present study.

Review of Literature : Neoclassical economics

To begin with, it may be useful to underline that "subcontracting relations between firms represent one of a species of interfirm relations which are largely ignored by economic theory."[36]

According to neoclassical theory, all inter-firm transactions are arms' length transactions co-ordinated by the 'invisible hand'; anonymous buyers and sellers exchange goods at competitive prices. In reality, the market for many intermediate products in the manufacturing sector is specialised and does not operate in this simplistic way. Certain intermediate products, say, multi-purpose standardized component parts (like bolts, nuts, chains, bearings, connectors etc.) manufactured on the basis of well-diffused, standardized technologies, may be procured through arms' length market transactions. But there are numerous intermediate products and operations for which firms establish

36. Andrew Friedman, op.cit.p.118

direct (extra-market) co-operative relationships on a vertical plane between themselves.

Standard books have covered the middle ground between competition and horizontal integration (through combination/ merger or take-over) where firms in the same business restrict competition through price agreements and market sharing. But they have abstracted from the middle ground between arms' length transactions and vertical integration[37] where firms on either side of a market co-operate via subcontracting, long-term contracts, leases, technical (patent licence) agreements etc.[38]

Further, neoclassical theory does not consider the inequality of firm-size distribution. It does not explain the cause and consequence of concentration of industries into fewer larger firms. Nor does it explain how multi-product, multi-plant conglomerates restructure their environment to meet their changing needs and operate more and more on an international scale.[39] The way firms subordinate and use smaller firms in the subcontracting networks they

37. This takes place not only when a single firm sets up all the production facilities on its own but also when two firms that are suppliers or customers of one another merge.
38. Andrew Friedman, op.cit.p.118; Edith T.Penrose, op.cit.p.21
39. See Sam Aaronovitch, "The Firm and Concentration", in Francis Green & Petter Nore (ed.), Economics An Anti-Text, MacMillan, 1977 p.76.

establish within and across borders in relation to their global production and marketing programmes is completely ignored.

None-the-less, there is no gainsaying the acceptance of subcontracting in a few neoclassical writings. Subcontracting is implied in the classic paper by Coase. He observed that the amount of vertical integration varied greatly from industry to industry and firm to firm and then posed the right question: "Why is not all production carried on by one big firm ?" His answer was that the enlargement of a firm results in decreasing returns to the entrepreneur function so much so that the firm will expand till the margin, where "the costs of organising within the firm will be equal either to the cost of organising in another firm or to the costs involved in leaving the transaction to be 'organised' by the price mechanism."[40]

In contrast to the earlier neoclassical tradition of a-priori theorising, there is now evidence of a growing trend towards some empirical investigation on subcontracting, a "murky area in the study of industrial economics"[41] The middle ground between vertical integration and arms' length market transactions has been variously christened as "partial market failure"[42] or "vertical inter-firm linkages"[43] or

40. See R.H.Coase, "The Nature of the Firm", Economica, November 1937, pp.394-95 and *passim*.
41. Sanjaya Lall, "Vertical Inter-firm Linkages in LDCs: An Empirical Study", Oxford Bulletin of Economics and Statistics, Vol.42, No.3, August p.203.
42. ibid. p.204.
43. ibid. Within the neoclassical framework, Lall has made a critique of traditional neoclassical thought and derived an analytical foundation for his own case studies of Ashok Leyland and TELCO in India on the basis of a few modern neoclassical contributions.

"vertical quasi-integration".[44] Such backward linkages include those fostered by subcontracting relations. It is now argued that they are not only "essential to the functioning of any normal industrial market...(but) they can stimulate the development of linked activities and industrial diversification in LCDs"[45]

To illustrate, Blois's seminal paper puts, perhaps, for the first time in neoclassical tradition, the influence **that** a dominant firm can exercise in the vertical plane in some perspective. The dominant buyer or large customer has many options with which it can threaten its existing suppliers with withdrawal of its business. It can shift the business to other suppliers; encourage new suppliers to enter the industry; or set up its own facilities or take over an existing supplier. These options are,however, only open to those customers whose total demand for the product concerned is sufficient enough to generate the same

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44. K.J.Blois, "Vertical Quasi-Integration", The Journal of Industrial Economics, Vol.20, No.3, July 1972. Quasi-integration is vertical integration without the legal form, as Blois puts it.

45. Sanjaya Lall, op.cit.p.204

scale economies as the existing suppliers do[46].

If the suppliers are market specific (i.e. their product is specific to one industrial market) and product specific (i.e. their plant and machinery are only geared to current product range), then such threats are all the more powerful and will greately determine the responsiveness of the suppliers to the power of the dominant buyers to call for special requirements, conditions and terms of trade. The unequal relationship between the customer and supplier/subcontractor can manifest in a number of areas wherein extra costs are incurred by the supplier. Unless these extra costs are incorporated in the price, they will

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46. Here we may add that even if internalisation or take-over is possible on the grounds of scale economies, there are certain costs which may discourage the customer from opting for vertical integration. Take-over of a large or medium (standardized) component supplier may not be worthwhile; it can be financially prohibitive; it can entail burden of undertaking costs of entering intermediate markets as a seller to many other customers as also of co-ordination arising out of being a seller. On the other hand, take-over of a small supplier would increase costs via loss of economics of small scale(e.g. low wages, less capital intensive and simplier technology or even technology that is not inferior to the parent firm's and suited to small-scale, more flexibility in terms of quicker decisions, simpler and quicker retooling of operations and easier lay-offs when final demand fluctuates, lower strike proneness etc). Also, take-over of the small-scale is very likely to boomerang by way of parity disputes (regarding wages and other working conditions). Further, growth via vertical integration increases the risk of the customer's capital, especially in the context of rapid technological progress and shrinking product life-cycles. It is also likely to invite government's anti-monopoly intervention. On these lines, See Andrew Friedman, op.cit. pp.120, 221, 224, and passim.; Sanjaya Lall, op.cit.

'suck off' the profitability of the supplier.

The dominant buyer can shift the burden of holding large stocks to the supplier. Sometimes it can demand more than one delivery of consignments a day despite each delivery being less than a lorry load. If it is a multi-plant firm or has stores dispersed over a wide area, it can ask the supplier to switch deliveries between different locations at very short notice and thereby increase the supplier's delivery charges. It can also exploit the supplier by demanding frequently sub-optimal volume of special products. It can demand access to supplier's plant and records not only to enforce quality control but also learn about the cost breakdowns of the products it intends purchasing. It can impose the condition that the supplier must not work for its competitors or embark on an ad campaign in truck with a competitor.

In the event of poor labour relations at the supplier affecting its production, it can compel the supplier to end the hitch on terms not agreeable to the supplier. It can even interfere to overhaul the supplier's management. Further, it can specify the materials and other items (even by the name of the source) to be incorporated into its end-product. Or it can give them at economical prices (due to large-scale buying economies). But for the supplier making profits on the basis of cost plus pricing method, that would interfere with its flexibility. Moreover, the customer, especially when suffering from a general financial crunch, can delay payment for longer periods.

The large customer can benefit from the speciality and capability of the supplier to effect changes in the design of certain intermediate products in the context of increasing technological complexity of many final products. But for the supplier, the employment of technical experts (oriented only to the current customer industry) and free provision of technical service is very risky and not always economical in the face of the uncertainity of work orders in immediate future.

The customer can apply pressure at the cost of supplier's future on the belief that the latter's average cost curve falls more rapidly than what the supplier concedes or that the latter's per unit profit is too high. A growing trend is that parent firms make estimates of cost and add an allowance for profit. But such estimates are subject to disputes. While it is easy to estimate prime cost (material and direct labour cost), the allocation of overheads between different product lines and the determination of margin size by apportioning the capital employed to different product classes are extremely complex.

The supplier has indeed some ways of resistance open to it against the bargaining power of the customer. It can reduce its dependency on any one client, but this option is not always open, when the number of potential customers for an individual item may be small as in the aircraft industry. It can perhaps diversify into other product ranges and sell to different industrial markets. But finding a suitable product range and setting up the necessary organisation to conduct diversification programme is usually complex.

The supplier itself can become a monopolist in a situation where there are two or three suppliers versus relatively more customers but "as a result of take-overs and mergers and also the integration of some firms' activities throughout Europe, bigger customers are created and thus making it possible for a customer to compete with its supplier's economies."[47]

If the supplier's skills and machinery are highly specific so that it would take considerable time for the large customer to collect them to produce the item on its own, then this time period plus the time taken by the productive facility to achieve economical costs could create elbow room enough for the supplier to diversify away from the existing markets. Another option is to diversify into the existing markets themselves in such a way as to offer the customer a range of products as an entity. If the customer tries to withdraw some part of its business from this range, then the supplier can reshuffle its prices across the range, possibly via a discount structure, so as to make the cost reduction of buying elsewhere to the customer" marginal and certainly less than one-twentieth."[48] But again this is not an easy alternative.

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47. K.J.Blois, op.cit.p.266

48. ibid. p.267.

Marxian studies

The a-historicity of the dominant neo-classical thinking fails to give a realistic picture of the firm and industrial organisation as they have developed under capitalism. Subcontracting as a specific industrial organisation is not new but is as old as the first stages of capitalism. When we study Marx[49] and Lenin[50], we find the linear evolution of organisation of production from simple or small commodity production, to various systems of subcontracting or putting out, to manufactories or workshops, and finally to mechanised factories.

With the expansion of market, the artisan or master-craftsman is subsumed under a putting out system organised by a merchant-capitalist or a capitalist risen from the ranks of the direct producers themselves. In the manufactory stage, big workshops put out work directly to domestic (home) workers or via small workshops (some of them owned by craftsmen or piecemasters) through a subcontract chain.

The central point is that subcontracting systems appear as transitional systems through their functioning. They, as conservative (technologically) lower forms of capitalism based on the worst forms of exploitation, are precursors

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49. See Karl Marx, Capital, Vol.1 (Part 4) 1887, Progress Publishers, Moscow 1983.

50. See V.I.Lenin, "The Handicraft Census of 1894-95 in Perm Gubernia and General Problems of 'Handicraft' Industry", in Collected Works Vol.2, Progress Publishers, Moscow 1972 pp.428-29 and passim; V.I.Lenin, The Development of Capitalism in Russia, 1899 (Chs.5 to 7), Progress Publishers, Moscow 1972.

to the organised system of machinery in a factory; all labour would be subsumed directly under the socializing impact of large-scale integrated factories in the process of capital accumulation and its concentration.[51]

Neo-Marxian and other studies

The studies by Dobb[52], Hobsbawm[53], Berg[54], Littler[55], Friedman[56], Shinohara[57] and several others discuss sub-contracting in early capitalism in Britain, Continental Europe, the US and Japan. They account for its appearance, disappearance and persistence on the basis of technical and

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51. Factories too exploited domestic workers through putting out but Marx expected that the Factory Acts in England would finally do away with the nexus between factories and domestic workers. Lenin also pointed out the use of domestic workers in certain trades(eg. readymade clothing) as an appendage to the large factory. He also indicated the incipient emergence of new small units doing auxiliary or ancillary work for large factories but he could not pursue why large-scale capitalism made such "seeming reversions to the past."

52. Maurice Dobb, Studies in the Development of Capitalism, Routledge Paperback, London 1963.

53. E.J.Hobsbawm, Labouring Men Studies in the History of Labour, Widenfeld and Nicolson, London 1964.

54. Maxine Berg (ed.), Technology and Toil in Nineteenth Century Britain, CSE Books, London 1979

55. Craig R.Littler, The Development of the Labour Process in Capitalist Societies: A Comparative Study of the Transformation of Work Organisation in Britain, Japan and the USA , Heinemann Educational Book Ltd., London 1982.

56. Andrew Friedman, op.cit.

57. Miyohei Shinohara, "A Survey of Japanese Literature on Small Industry" in Bert Hoselitz(ed.), The Role of Small Industry in the Process of Economic Growth, Mouton The Hague & Paris 1968.

and non-technical factors, a detailed examination of which, trade by trade, is beyond the scope of this study. A brief sketch of the 19th century subcontracting, however, would be a useful background to understanding the emergence of the phenomenon in the 20th century.

According to Littler, there exists "considerable confusion on the notion of subcontract" in early capitalism because of the failure to distinguish the variously named systems of subcontract in different trades between "external subcontract" and "internal contract".[58] The 'external subcontract' refers to the putting out/outworking systems of production under the hegemony of merchant-manufacturers. The 'internal contract' refers to the situations in which "the immediate employer of many workers was not the large capitalist, but an intermediary, internal contractor who had a contractural relationship with the over-arching employer, and in turn was an employer of labour himself. The employer provided the fixed capital, supplied the raw material and much of the working capital and controlled the sale of the finished product. The contractor hired and fired, supervised the work process and received a lumpsum from the employer for completed work."[59]

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58. Littler, op.cit. p.65

59. ibid. p.65.

The external subcontract system appeared in economic history much earlier than the internal contract system. The latter was a somewhat refined version of the former; it was a semi-factory system in that it meant subcontracting of management and employment[60]. Also, very broadly speaking, in the 19th century while the external subcontract operated in consumer goods industries, the internal contract operated and passed away, especially in metal working/engineering industries. Both the systems were forms of operation and spatial extension of capitalism.

In Britain, the putting out system showed a significant development from the late 16th century through the 18th century when the Industrial Revolution ushered in radical changes in the character of production. Alongside its growth, the rise of manufactories or internalisation of production operations under a single roof happened as a way of overcoming certain problems intrinsic to the functioning of the putting out system itself. First, the speed of the production could not be controlled. A lot of time was wasted due to lack of proper co-ordination of different stages of the work. Also, production deadlines could not be ensured because the merchant lacked control over the labour power of the domestic workers. Secondly, because of the hand-technology, production could not be expanded except extensively but this in turn significantly

60. Hence it is also called the system of "co-exploitation". See Hobsbawm, op.cit. p.298 and passim. Friedman reacts to this and remarks that "this delegation of managerial authority has continued long beyond capitalism's early stages. What was once carried out via quasi-market transaction in the form of subcontracting is now carried out through the complex bureaucratic structures incorporating many layers of middle managers, and often several layers of trade union bureaucrats and a fat book on Procedure" See Andrew Friedmen, op.cit.p.79.

increased the marginal transport and distribution costs. Thirdly, there were many cases of pilfering of rawmaterials and patterns by craftsmen and other domestic workers. Finally, quality controlling suffered.

The period of Industrial Révolution and the 19th century (1775-1875) brought into the industrial scene the factory system which radically altered the production process as machines were harnessed to mechanical motive power out of steam or water. This development hastened the drive to concentrate production operations in a single place of work. However, this was a very uneven process in different trades.

In fact, in several consumer trades, technological innovations (eg. the 'revolutionary' sewing machine), Factory and Workshop Acts, Education Acts (affecting the availability of child labour), minimum wage legislation and anti-subcontracting legislation gave fresh life to the putting out/ outworking relations in the second-half of the 19th century in Britain -- a period characterised by mechanisation and heavy industrialization (in iron, steel, coal and all manner of metal working/engineering industries).

Outworking based on female labour became a substitute for factory operations simply because it was cheaper. It was a potent hedge against unionism. It was also flexible vis-a-vis the vicissitudes of a highly seasonal trade.[61] Even during the 1920s and 1930s the cotton industry consisted of partially integrated plants making use of outworking and piece-work for flexibility. Thus, there was no inevitable tendency towards composite, large plants. Friedman argues that "while outworkers represent an easily visible, unequal co-operative relation between large and small producing units or between capital and labour (which cannot be completely captured by classification as wage-labour), often the relations between large and small factory-working firms are of a similar type. These relations, far from declining after the 1820s, have grown in importance throughout the Modern Industry stage and generally characterise the organisation of industry during Monopoly Capitalism."[62]

The internal contracting system was the means of managing production and labor force in the 19th century not only in certain trades still at the stage of outwork and domestic system but also in factory trades.[63] It was seen in one form or another in most industries where piece work was obtained from the capitalist employers who could not establish factory system proper.

61.Maxine Berg, op.cit.p.225-26 and passim; also see James Andrew Schmiechen, "Sweated Industries and Sweated Labour: A Study of Industrial Disorganisation and Worker Attitudes in the London Clothing Trades, 1867-1909", The Journal of Economic History, Vol.36, No.1, March 1976 pp.283-86; Joan Wallach Scott, "The Mechanisation of Women's Work", Scientific American, Vol.247, No.3, September 1982, p.147.

62.Andrew Friedman, op.cit.p.35

63.See Dobb, op.cit.p.265

The internal contract, in general, "provided a historical solution to the contradictions between the increasing size of firms and simple entrepreneurial control, especially in the context of scarce managerial resources."[64] In particular, it made the production organisation flexible so as to adapt itself to sharp demand fluctuations without having to bear a permanent burden of overheads. It spread capital risks and saved the employers from numerous, complex cost calculations. The employers could overcome their technical ignorance. It provided incentives to contractors to work hard themselves and to slave-drive the 'unskilled' workers they employed. But as the techno-economic context changed (in terms of centralising technological changes, Great Depression between 1873-96) the internal contract came under acute pressure from above and, more importantly, from below due to the organisation and rebellion of the 'unskilled' workers. It was ultimately discarded by the employers.[65]

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64. Littler, op.cit.p.67

65. For details, see ibid.pp.67-84; Bernard Elbaum and Frank Wilkinson, "Industrial Relations and Uneven Development: A Comparative Study of the American and British Steel Industries", Cambridge Journal of Economics, Vol.3,1979.

In the USA, what was significant was the widespread prevalence of the "inside contract"[66] in the first wave of the industrialization process which took place largely between 1850-1880. It operated in industries like iron and steel, foundries (especially, stove moulding), coal industry, engineering, armaments, government arsenals, potteries, glass, newspaper printing, and clothing.

The necessity for internal contracting in the US case was also the same as in the British case. None-the-less, what was strikingly different from the latter "arose from the immigrant origins of the American labour force. The racial and ethnic divisions in American society were reproduced at the level of the work organisation and work-team. Internal contract, in the USA was a mechanism for the 'justifiable exploitation' of newer immigrant groups."[67] And the decline and demise of the internal contract in the US occurred much earlier than elsewhere in an expansionary period (of new materials, new products and new processes) and due to the pressure from the employers.

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66. See John Buttrick, "The Inside Contract System", The Journal of Economic History, Vol.12, No.3, Summer 1952. Note that Littler's internal contract is the same as Buttrick's inside contract. The former seems to have borrowed the concept of this kind of subcontracting from the latter's contribution. Such categories are not found in the works of Dobb, Hobsbawm, Friedman etc., though they have specified its mechanism in the sense described by Littler and Buttrick.

67. Littler, op.cit. p.167.

In Japan, the development of the putting out system was seen around the mid-18th century under the control of wholesale merchants and even wealthy farmers. Non-factory putting out system consisted of (a) peasant industry in the weaving districts, (b) artisan industry, and (c) subsidiary homework (as in book-binding, embroidery, patching of match boxes, celluloid toys etc.). This changed into a subcontracting system in which the subcontractors used machines and motors and employed workers. Then came the phase of "vertical inter-firm hierarchy" in which the big business controlled the subcontractors from inside the production process; that is, they shared the production process technologically with small and medium subcontractors.

An extremely important point that emerges from the Japanese case is that during the period 1900-45, the petty and small-scale producers in traditional as well as new industries "adapted to the age of mechanisation quite well by using electricity, instead of steam power which wiped out small enterprises during the industrial revolution in Europe."[68]

68. Susumu Watanabe, "Technological Linkages.."op.cit.pp.29-30. He points out that "electric motors became increasingly popular after 1905. By merely extending an electric wire to an ordinary house and installing one small electric motor within the house, petty producers could mechanise their operation. While industrial wages rose, labour productivity could be increased considerably by this innovation which required only small amounts of capital. Electric motors permitted at the same time a maximum degree of flexibility in factory layout and work organisation. Thus there is consensus among Japanese scholars that the early spread of electricity and electric motors has been one of the key contributors to the continued existence of a large number of small enterprises and maintenance of their efficiency." This development clearly belied the expectations of Marx and Lenin about physical concentration of industries, because of the "necessity of running machines from a central energy source - the steam engine". On this point, also see Fergus Murray, "The Decentralization of Production - The Decline of the Mass-Collective Worker?", Capital & Class, No.19 Spring 1983, p.76.

In metal engineering, the subcontract work from the large factories passed on to the small and petty subcontractors through the mediation of Tonyas, the merchant brokers who charged high rates of commission. The subcontractors acted as 'reserve army' for the large units and helped them in meeting peak demand by doing rough finishing of parts etc. But the subcontracting relations were 'floating', that is, very unstable. And the merchant brokers could not offer technological assistance related to modern industry to the petty producers. So the quality of subcontract work deteriorated and the rejection rate shot up. These demerits manifested during the period of "recurrent recessions and the Great Depression in the 1920s and early 1930s". The cut-throat competition among the brokers led to relentless cuts in producers' prices[69] and ultimately resulted in the image of Japanese exports as 'cheap and low-qualified products.'

In the late '30s, when the above problems were compounded by the mounting shortage of materials and work-force, the subcontracting system was rationalised and the inferior producers were weeded out. Materials were rationed among a select group of producers (above certain standards) and then unit prices were cut so that "those who could not

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69. Hence this was a period of "the exploitation of subcontracting small-medium factories by monopolistic big corporations" as the latter shifted the deleterious effects of depression to the former by way of reduced payments. See Shinohara, in Hoselitz (ed.) op.cit.p.10

reduce the prices were eliminated". The parent firms went for pyramidal or vertical grouping of the most efficient subcontractors, kept them under their direct control, gave them regular work-orders, and played an active part (supported by the government) in bridging the technological gap between them and the small and petty producers. They trained the employees of the subcontractors. They sent instructors from among their own staff. They provided the subcontractors with the equipment like jigs and gauges necessary for quality control. And they altered the methods of production and encouraged division of labour and specialisation among the subcontractors themselves in a narrow range of activities rather than allowing them to do everything at their workshops.

Thus, such reshuffling of subcontracting system eliminated the room for the intervention of the merchant brokers as intermediaries between machinery manufacturers and subcontractors. A stable paternalistic subcontracting chain system came into existence and consolidated itself. Such rationalisation of production organisation was part of the wider process that saw the relative increase in the hegemony of 'industrial capital' while industrializing heavily.

The shortage of workforce due to absence of well-organised external labour markets was overcome by the employers through the 'factory dormitory system' (in textile industries employing predominantly women workers) and the internal contract system or Oyakata-Kokata system(i.e. master workmen with their bands of followers). However, the internal contract system withered away during the period from 1910 through the First World War to the '20s and '30s because of the attacks on it by the employers, especially in metalworking/engineering industries[70].

The internal contracting systems in Britain, the US and Japan were supplanted by centralised managerial control. But immediately after acquiring control over the shopfloor, the capitalist employers were confronted with three problems: lack of work-flow co-ordination, rudimentary cost controls and the 'labour problem'. They had to evolve techniques of overcoming these problems under the influence of the 'systematic management movement' or Taylor's 'scientific management' and developments in cost accounting, in their pure or modified form and content. While in the US and

70. The internal contract system reached its limits; it led to labour unrest and the threat of socialist and militant union activity. It could not reduce labour turnover and overcome the shortage of skilled labour. The masterworkmen's technical expertise was of no use in the light of increased production, complex machinery (usually imported from abroad), diverse products and new types of rawmaterials. When the Oyakata opposed the employers' move to remove them, they and their gangs were co-opted through the famous life-time employment and seniority-based wage systems. The Oyakata-led unions were also formally recognised. Thus, corporate paternalism came into operation. The costs of this rearrangement were sought to be compensated by the creation of the dual industrial structure through external subcontracting. See Littler, op.cit.pp.151-54 and passim; Solomon B.Levine, "Labour Markets and Collective Bargaining in Japan", in William W,Lockwood(ed), The State and Economic Enterprise in Japan Essays in the Political Economy of Growth, Princeton University Press, 1965,p.643 and passim.

Britain neo-Taylorite forms of work organisation superseded internal contracting, in Japan corporate paternalism that absorbed some aspects of Taylorism came into existence, alongside external subcontracting.[71]

Taylorism meant three things: first, a meticulous analysis of complicated jobs of the production process, its division and subdivision into simpler jobs and then establishing standardized labour norms for each so as to maximise results vis-a-vis effort[72]; secondly, a discovery of the labour cost of each divided and subdivided job which was then constantly scrutinised[73]; and thirdly, an incentive system or a system of 'hard-driving' that could squeeze maximum intensity out of workers -- the so-called system of payment by results or piece rate system[74].

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71. See Littler, op.cit. pp.155-60, 174-82; Hobsbawm, op.cit. pp.357-58.

72. See Kendall E.Bailes, "Alexie Gastev and the Soviet controversy over Taylorism, 1918-24", Soviet Studies, Vol.29, No.3, July 1977 p.381 and passim for a good account of Taylorism. Note that the gains in productivity and savings in cost due to deskilling of work and particular specialism of workers was pointed out much earlier (in 1835) by Charles Babbage. On the Babbage principle and Taylorism, See John Kelley, "Useful Work and Useless Toil", Marxism Today , August 1982, pp.12-13.

73. Hobsbawm, op.cit.p.358.

74. See Kendall Bailes, op.cit. pp 381-82; Piece Wages were not the invention of Taylor at all. On its historical development, see Marx, op.cit.pp.516-30; On the complex issue of fixing piece wages, see Clews and Leonard, op.cit.pp.136-39.

Thus, Taylorism in operation on the shopfloor meant not only higher labour productivity but also lower unit labour cost. What was really important from the employers' side was its deskilling effect now that "workers with relatively little skill and even untested work habits could be fitted into this scheme without lowering productivity."[75] Taylorism was refined by Gilbreths' time and motion studies[76] and superseded by Fordism[77] in 1920s. All these developments smashed the job autonomy of workers. The "one best way" of doing every job would henceforth be determined by the science of outside experts, the pace of work being governed by the machine used.

Taylorism and Fordism in turn led to new contradictions. An inquiry into the 20th century subcontracting throws some light on external subcontracting and the modern version of internal contract system, namely, the "labour only subcontracting" as resolutions in part to those contraditions. Before we take up that task, we could restate the traditional Marxian

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75. See Zenovia A.Sochor, "Soviet Taylorism Revisited", Soviet Studies, Vol.33, No.2, April,1981, p.257.

76. See Bailes, op.cit. p.382; Clews and Leonard,op.cit. pp.21-22, 133-36.

77. See David Gartman, "Origins of the Assembly Line and Capitalist Control of Work at Ford", in Andrew Zimbalist (ed.), Case Studies on the Labor Process,Monthly Review Press, 1979, p.194. Under this system, Gartman says : "The product is divided into a number of parts produced by different workers with such accuracy as to be interchangeable. These parts are then assembled. All production flows continuously from one stage to the next." In this connection, also see Michel Aglietta, op.cit. pp.116-22. He defines Fordism as 'semi-automatic assembly-line production' of mass consumer goods produced in long runs as also of the standardized intermediate components for the final assembly of consumer goods.

position in the light of the foregoing discussion.

The persistence of subcontracting

It is true that large-scale factory operations have taken over several industrial branches which were formerly characterised by subcontracting system not only during the times of Marx and Lenin but also later on. The central point, however, is that this process has been uneven and combined[78]. And today if we were to take a global view of production organisation, we would find the co-existence of heterogeneous forms of production.

Subcontracting in the 20th century has continued to persist, discontinuously though, despite the rise and do-dominance of factory system. Spatially, it has declined in some areas but emerged elsewhere and reappeared again in the areas in which it had passed away previously because conditions facilitating it are recreated, more so under the sway of highly mobile big capital. In certain cases a reversal of the linear order of the evolution of production organisation has occurred. Large factories have disappeared and subcontracting as well as small workshops have appeared. In many cases, large firms have tended to reduce plant size, or split up production cycle between small plants. Again they have subcontracted out work to a vast network of small firms,

78. "While particular forms of capitalist production have declined and almost disappeared, Capitalism has always been characterized by relations between more modern and less modern forms." For elaboration, see Andrew Friedman, op.cit. p.35 and passim.

artisan workshops and household outworkers/homeworkers. There are also instances of the decline and fall and later rise of subcontracting in the same industrial branch. Thus, subcontracting does not seem to be transitional. Nor does it seem to function as an ostacle to capitalist progress. Interestingly, new technological changes seem to have a dual tendency of furthering as well as hindering the growth of subcontracting relations. Definitive, sweeping generalizations are very difficult to make. Product, industry and country specificities will have to be considered[79]. A meticulous inquiry about these lines is beyond the scope of the present study.

A question however remains: If subcontracting relations are "archaic and disappearing systems of production", then why are they existing and expanding even today in not only traditional labour intensive industries but, more importantly, in light and heavy modern industries ?

Further, the complementary nature of large and small enterprises in the process of capital accumulation and its concentration since the turn of the century, more so in the inter-war and post-war periods, has been relatively

79. It would be unfair to attack Marx and Lenin because of the modern developments on these lines. Obviously, the contexts are different. The natural progression of organisation of production was not an apriori theorisation or assumption. It was based on the evidence they had collected and their own historically specific observations. However, the criticism can apply to Marxian thinkers like Mandel (in his Marxist Economic Theory) who have not reckoned with the new developments. Even Mandel had to recognise domestic and international subcontracting, rather late, though, in his 'late capitalism'. See Ernest Mandel, Late Capitalism, Verso 1975 pp.373-74, 535.

unexplored despite the fact that the processes of concentration and centralisation of capital have not been incompatible with the growth of subcontracting networks linking up big and small capitals[80].

Thus, the persistence of subcontracting is interconnected with the much more complex and broader issue of the persistence of the small firm.[81] An enquiry into subcontracting explains to a considerable extent the apparently paradoxical (or vestigial or exceptional) survival of small-scale manufacturing units in the process of economic development.[82]

Permissive attitudes towards concentration have led to the analysis of the growth of large firm only despite the truth that "large firms derive much of their discretionary

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80. This important point is derived from Michel Aglietta, op.cit.p.220. He believes that subcontracting networks enable centralized capitals to organise segmentation of labour market while dispersing and isolating their workforce.

81. Small firms are important not only in manufacturing but also in construction, farming, quarrying, transport, distributive trades (wholesaling/retailing), service industries and in professional services. So, an attempt at explaining the persistence of the small firm has to consider the competitive and complementary nature of small and large firms and account for the circumstances and reasons for their survival and growth in these variety of activities.

82. Maurice Dobb is perhaps the first person in the modern Marxist stream to address himself to the baffling questions of the persistence of small firm and subcontracting quite contrary to the false allegation by Hubert Schmitz that Dobb saw them as transitional, to be superseded by in-house, large factory production. See Dobb, op.cit. pp.341-47; Hubert Schmitz, "Growth Constraints on Small-scale Manufacturing in Developing Countries: A Critical Review", World Development, Vol.10, No.6, 1982, p.435.

power from their relations (including subcontracting) with smaller ones".[83] There are a number of problems in understanding large firm's size itself. First, a large factory is not inevitable; recent developments point out that factory size is not related to the growth of large firm.[84] Secondly, technical economies of scale at the plant level and the Schumpeterian thesis of overwhelming advantage that large firms have in innovation as explanations for increasing concentration have been empirically invalidated.[85] Further, there exists "no correlation between the importance of large firms and the level of output or the rate of economic growth."[86]

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83. Andrew Friedman, op.cit. p.23 and passim.

84. We owe this point to Fergus Murray. His study of productive decentralization in Italy reveals that "factory size is not given, and least of all does not necessarily correspond with the size of a firm or corporation's turnover, or their market and financial strength. Rather it is determined by the specific configuration of the conditions for profitable production prevailing in any given period." See Fergus Murray, op.cit. p.76.

85. The following reasons are adduced. First, S.J.Prais (in his The Evolution of Giant Firms in Britain, Cambridge University Press) found that in the U.K., high aggregate concentration was not due to firms building larger and larger plants. It was because firms were building or acquiring more plants. Large firms bought up small firms. Secondly, there is no evidence to support the Schumpeterian view in toto. J.Jewkes, D.Sawyers and R.Stillerman (in their The Sources of Innovation, MacMillan 1969) found that in the post-1900 period most invention and innovation was not sourced in large firms but in small firms. See Graham Bannock, The Economics of Small Firms Return from the Wilderness, Basil Blackwell, Oxford 1981, pp.85-88.

86. ibid.p.92.

By contrast, actually small firms[87] are numerically predominant in industrial as well as industrializing countries[88]. They "constitute at least 90 per cent of the population of enterprises but in many developed countries the two decades following 1945 saw a decline in the proportion of total output produced by such firms. There is now evidence to suggest that this decline has ceased and even been reversed", for instance, in Britain since the mid-60s[89].

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87. What is a small firm ? The answer is very difficult. There are numerous statistical definitions that differ between countries. Definitions are made in relation to net worth or fixed assets, total employment(including or excluding homeworkers), total output, total sales, energy consumption, number of customers, market share, value added etc; they also differ from sector to sector (manufacturing, construction, distributive trades, services etc.); And the criteria for 'small' vary depending on context and use. For example, in the US, American Motors holds only 2% market share. So it is small. But it employs 28,000 employees. So, it is big ! Thus, what is 'small' in one context and use may not be so in a different context and use. Some writers emphasize the characteristics epitomising the operations of a typical small firm such as small market share (although it can hold a large market share in a small market), legally independent ownership, non-accessibility to the capital market for the public issue or placing of securities, single product line or a set of closely related products, single plant in general etc. For some writers, subsidiaries of large companies are not small. Statistical data are on establishment (plant) basis in some countries. Elsewhere, they are on a single ownership (firm) basis. Thus, the definitional embroglio makes it extremely difficult to embark on an international comparative analysis of the relative importance of small firms. See Graham Bannock, op.cit. pp.26, 28-29; D.J.Storey, Entrepreneurship and the New Firm, CroomHelm, London 1982, pp.6-7.

88. Whether one country has fewer small firms than others is difficult to say because there is little information on entries to and exits from small firm population of any country. Also data on "large firms taking over small, on an enterprise basis" are not available. Bannock, op.cit.p.53.

89. D.J.Storey, op.cit.p.5

The share of small firms in manufacturing employment is shown to have declined in industrial countries in the post-war period. But Japan has been the exception. The share of small firms in creating employment has also risen in Switzerland and seems to be very much so in Italy. According to a recent OECD estimate, small and medium enterprises (SMEs with less than or equal to 500 employees) account for 45 to 70 per cent of industrial employment in member countries around the mid-'70s. And "the place of SMEs in different sectors varies little from one country to another. But their relations with large firms, especially through subcontracting may vary appreciably between countries".[90]

In industrial countries, over the last decade there has been resurgence of small-firm sector, especially of technology-based small firms. Micro-electronics revolution has altered the engineering principles of the conventional concept of economies of scale and has recreated conditions for the renascence of small firms and subcontracting as well as single-roof, integrated production.

Furthermore, with the development of "over-extended firms" afflicted with acute "diseconomies of scale" or

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90. See OECD, Innovation in Small and Medium Firms, Paris 1982 p.7, 9; Genevieve Duchi & Suzane Savey, "The Rising Importance of Small and Medium-Sized firms: Towards a New Industrial System?", in F.E.Hamilton (ed.), Industrial Change in Advanced Economies, Croom Helm, 1987 p.3; Charles J. McMillan, The Japanese Industrial System, Walter de Gruyter, Berlin/New York 1985, p.60-61; Hideichiro Nakamura, "The Challenge of Japanese Small Business", Japanese Economic Studies, Fall 1986,pp.85-87.

"decreasing returns to scale", the fetishism of large-scale has given way to the fetishism of the small-scale. This is reflected in the various measures of promotion and assistance that various governments have taken up and in the feverish recognition of flexible, innovative and net business creative aspects of small firms (especially since late '70s)[91].

Surely, the small firms are not "anachronistic survivals in a world of promising technology"[92] or"outmoded and a sign of technological and economic immutability".[93] And subcontracting, considered to be an archaic technology-retarding practice, seems to become alive instead of becoming passe under the new technology regime.

Subcontracting in industrial countries

As UNIDO points out, "the degree of dependence on small firms varies, but reliance on outside producers is the rule rather than the exception" in industrial countries.[94]

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91. Bannock, op.cit.p.93,97; D.J.Storey, op.cit.p.21; Also see OECD, Problems and Policies Relating to Small and Medium-sized Business, Paris 1971; OECD, Policies to Assist Adaptation by Smaller Business, Paris 1972; Ray Rothwell and W.Zegveld, Small and Medium-Sized Manufacturing Firms: Their Role and Problems in Innovation. Government Policy in Europe, the USA, Canada, Japan and Israel, 2 vols. TNO, Delft/Netherlands June 1978.

92. See Storey, op.cit.p.10;

93. See Bannock, op.cit.p.50

94. UNIDO, op.cit.p.21

In particular, the Japanese and Italian experiences most clearly show that subcontracting is very much integral to their competitive industrial strength, export power, economic growth and resilience against crisis. On sifting the evidence presented in considerable literature on subcontracting in Britain, Sweden, West Germany, France, Italy, Japan and the US, one could notice the following essential findings and trends.

The three types of subcontracting -- 'industrial', 'commercial' and 'labour-only' and the three forms of subcontracting--economy, specialized and capacity-- are present. The main reason for the prevalence of economy subcontracting could be found in the upward pressure on wages due to (a) concessions granted to internal labour market bargaining after the internal contract systems withered away, (b) narrowing of wage gap between skilled and semi-skilled or unskilled as the latter got strongly unionised and (c) drying up of the active reserve army of labour in the post-war period up till the early '70s.[95] The imperative for economising also cropped up due to increase in overhead costs in terms of the 'fixed' labour content such as managerial and technical staff. Overhead costs also increased (from the inter-war period itself) due to increase in the number of

95. In Japan, labour shortages and high labour costs developed from the early '60s onwards.

administrative workers (bureaucracy) as a consequence of the standardization of the tasks of the factory and the firm[96].

For the large firm, subcontracting of innovation is advantageous because in the event of its success it could be taken up for mass commercialization; in the case of its failure there would be little loss. The specialist sub-contractors bear the risks and uncertainities in the pressing context of rapid technological obsolescence, shorter life-cycles of products and the urgency to reduce lead time (i.e. time taken to bring a product to the market). They pioneer technologies and effect changes in detail design and manu-facturing techniques and thereby keep the large firms floating in highly competitive and innovative markets apart from giving them cost-cutbacks. The small specialist jobshops often have to follow the directives of large firms. Their survival is dependent on alleviating the risks or avoiding going under by means of diversification of their clientele.[97]

Subcontracting has been used to increase labour exploitation; more importantly, it has evolved as an anti-

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96. See Anthony Tillet, "Industry and Management: An Historical Perspective" in Anthony Tillet, Thomas Kempner and Gordon Wills (ed.), Management Thinkers, Pelican Books 1978 p.43.

97. See in this connection, Edward P.Hawthorne, The Management of Technology, McGraw-Hill Book Co.(UK) Ltd. 1978 p.123 and passim.; Ieuan Maddock, "Can Science-based companies Survive ?", New Scientist, September 6, 1973 pp.566-70 and Ieuan Maddock, "Subcontracting--Key to Survival", New Scientist, September 13, 1973.

union instrument so as to break the militancy/belligerence of organised labour disrupting productive operations and threatening large-firm profitability.

Large firms have used smaller firms via subcontracting as a buffer/cushion against seasonal and cyclical fluctuations in product markets. When demand picks up, capacity subcontracting is adopted because large firms cannot expand capacity quickly enough or in the light of past experience they deliberately do not expand capacity in order to avoid the risk of a sudden slump. In depressed times, the subcontractors bear the responsibility for idle overheads. Also, during the downturn, large firms can shift their financial troubles to small subcontractors; it is easy for them to squeeze them by simply not paying their bills or delaying them or by cutting contract prices or by even cutting orders, given the unequal power relation between large and small firms. Actually, the small subcontractors suffer a three-way squeeze in depressed times from their customers, raw material suppliers and banks; many of them get crushed ultimately. In short, subcontractors will be the first victims in depression unlike in boom when they will "climb on their contractors' coat-tails", so to speak. Moreover, in times of declining demand, top-down impact apart, ruthless competition between subcontractors themselves makes their situation all the more vulnerable.

Another advantage to the large firms during the downturn is that small subcontractors can retrench their workers easily whereas they themselves cannot do so because of strong shopfloor organisation and established procedure which, in the event of retrenching some workers, might worsen industrial relations with those who remain.

Large firms also derive flexibility by generally maintaining a number of alternative sources of supply(multi-sourcing) for the same item or similar items as a hedge against disruptions or interruptions in the flow of components to the relentless assembly lines due to labour-management troubles, problems of poor co-ordination etc., either from any one supplier/subcontractor or from their component producing in-house facilities themselves. And, in so far as it disperses the responsibility for overheads and fragments the workforce, multi-sourcing "makes it easier for firms to adjust desired output when faced with fluctuations in final product demand."[98]

Multi-sourcing nationally has been transformed into multi-sourcing internationally (for raw materials, components, subassemblies, final assembly operations) from the mid - '60s it has become, in both cases, an extremely potent weapon against the intransigent labour radicalism.

98. Andrew Friedman, op.cit. p.122.

Subcontracting has developed in recent times because of the possibility to fragment the productive process without reduction in productivity or without recourse to inferior technology.[99]

Another very important development in recent times has been the resurgence of subcontracting on the basis of home-working and mini-firm/cottage industry in Britain, Italy and the U.S. In Britain, apart from computer industry software work (programming or system modelling), there are numerous consumer items,[100] the production of which involves subcontracting arrangement with home-workers (primarily ethnic minority, immigrant women).[101] In the US, home-working has increased in electronics industry (for software work and subassembly operations) involving the exploitation of women (mostly

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99. On the way this has happened, for instance, in Italy, see Sebastiano Brusco, "The Emilian Model : Productive Decentralization and Social Integration", Cambridge Journal of Economics, Vol.6, No.2, June 1982 pp,172-73 and passim.

100. These are clothing, knitware, food, toys, leisure goods, household furnishings, cleaning materials, paper garments for incontinents, greeting cards, boxes for chocolates and perfume, swimming pool cleaners, brushes, fireworks, shoes, lampshades, zips, electric goods, stuffed envelopes, bows, files etc. Homeworkers also make industrial transmission belts.

101. See Swasti Mitter, "Industrial Restructuring and Homeworking: Immigrant Women in the UK Clothing Industry", Capital & Class, No.27, Winter 1986; and Sheila Allen and Carol Wolkowitz, "The Control of Women's Labour : The Case of Homeworking", Feminist Review, No.22, Spring 1986; Interestingly, in printing and shoe industries, there are dual tendencies of large-scale production and homeworking on account of technological progress. See Frank Wilkinson, op.cit. p.424.

immigrant)[102]. In Japan, homeworking on piecerates (by women) is at the bottom of the hierarchical subcontracting system. These women do traditional jobs (eg.sewing,craft work etc) as also new jobs (eg. cutting the edge of parts for automobile press work, making machines for diesel engine fuel pumps, assembling parts for electric appliances like radio and television sets and communication instruments)[103].

In consumer trades with volatile markets due to changing taste and fashion, new technology (computers and electronic communication devices) have been used to acquire control over marketing and distribution and a chain of sub-contracting involving tiny firms and homeworkers is used to acquire flexibility and cost-reduction. In some instances, delivery has been speeded up by automating (via robots) the warehouse. Thus, the impact of new technology ('information tech-nology') in the 20th century is analogous to the impact of sewing machine in the 19th century as far as the growth of homeworking on subcontract goes.[104]

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102. Personal Communication with Profs.Barbara Chasin and Gilbert Zicklin, Dept.of Sociology, Montclair State College, Upper Montclair, New Jersey, USA; and with Margaret George Cramer, Dept.of Anthropology, UC Davis, California, USA; Also see Joan Wallach Scott, op.cit. p.147.

103. See Kaji Etsuko, "The Invisible Proletariat : Working Women in Japan", Ampo Japan-Asia Quarterly Review, No.18, Autmn 1973.

104. That the contemporary impact of computers on women (via homeworking) is analogous to that of the sewing machine in the 19th century is highlighted by Joan Wallach Scott, op.cit. p.147.

The growth of homeworking and tiny-firm sector in industrial countries illustrates how domestic subcontracting has become a substitute for international subcontracting. The reorganisation of the Japanese textile industry on the basis of up-market movement, product differentiation, and domestic subcontracting relations in the production sphere in the context of foreign competition is another example in this regard.

The fragmentation of industrial structure can be understood ultimately in the light of changes in product market conditions -- the capricious nature of demand or the notorious seasonality and cyclicality. As product markets became saturated, inter-firm competition turned intense on the basis of more frequent and more attractive new products (i.e. model updates) to satisfy the significant increase in demand for varied and customised goods. To put it differently, life cycles of products became shorter and shorter; hence the compulsion to produce easier and cheaper product variety in short runs.

The new product market conditions exposed the bankruptcy of the conventional notion of economies of scale in mass assembly or manufacturing industries. They necessitated fluid work arrangements on the shopfloor. But this could not be achieved due to the rigidly codified division of labour imposed by the Taylorite and Fordist techniques and the acceptance of the codified work rules and work standards by the unions. When the management tried to alter the rigid status quo, the unions fought back to retain their shop-floor say. However, initial attempts at restructuring the conventional assembly line in terms of breaking it into several bays and work islands (the so-called neo-Fordism) to effect product differentiation became successful in some cases. But this exposed the glaring (uneconomical)limitation of engineering in small batches at the level of parts-making.

With the development and diffusion of computerised production techniques (flexible automation), the problems of both the final assembly and parts-making stages have been successfully tackled. Mechatronics (i.e. combination of traditional mechanical technology and electronic technology as eminently epitomised by numerical control machine tools and robots) has been rapidly diffusing among suppliers/ subcontractors for the efficient manufacture of small runs of varied parts (small or large-sized).

It is worth noting from the Japanese experience that a parent firm's "guidance and assistance" to its subcontractors takes place mainly in connection with the determination of the unit price of their products.[105] Parent firms' demand

105."The unit price of the subcontractor's product is given by an hourly rate multiplied by the standard time required for the work, where the hourly rate is equal to the labor cost per unit of time plus miscellaneous overhead costs and the standard time is the time required for the work when it is done most efficiently (eg. at the parent firm). Alternatively, it may be fixed on the basis of a target sales price of the end product. In many cases, offered prices are considered to be too low by their subcontractors. When such complaints are made, parent firms send their experts to the firm who point out all the sources of waste and inefficiency and show the subcontractor how to cut costs in concrete terms". See Susumu Watanabe, "Technological Linkages....",op.cit.p.51

for price cuts and assistance to achieve such targets are relayed from the top of the pyramid down to homeworkers at the bottom in a way resembling the 'bucket-relay fire extinction' method.[106] Such rationalisation explains the efficiency -- cost saving, productivity increases, low rejection rates of parts -- and competitive strength of the Japanese industrial system.

Also notable is the way the final assemblers keep not only their factories but also their subcontractors in perpetual alert through a system of stock control called 'just-in-time', 'kamban', 'supermarket' or 'semaphoric card' system. This system, modified recently by the use of computers, synchronises the production programmes of the final assemblers with deliveries of parts in timely and appropriate amounts from the surrounding ring of technically advanced subcontractors. The system minimises or eliminates altogether all waste of time and materials and has made profound difference in the competitive power of the US plants and the

106. Note the following excellent illustration: "Japan's hierarchical system of subcontracting is forcing even smaller companies to automate quickly. At its factory employing 300 workers in the vast industrial sprawl west of Tokyo, a big supplier of frames for televisions and video recorders called Tensho Electric has recently installed five painting robots. These have proved cheaper, 50% quicker and more reliable than skilled paint workers, who take three years to train...Every year Tensho is told by its buyers, big companies like electronics maker Victor Company of Japan, to cut its prices. Tensho passes on the message to its own subcontractors, who make one third of the final products it sells. So...it persuaded a tiny firm nearby called Plum Electric, employing only 15 people, to buy a painting robot. Tensho sent its own men to show the small firm how to use it. It is pressing three other similar suppliers to buy painting machines too. Now Tensho thinks it can safely ask for a cut in what it pays suppliers, without jeopardising the quality of what its subcontractors make". See Hugh Sandeman, "Where Growth Still Works", The Economist, July 18, 1981 p.4. (Japanese Industry Survey).

Japanese plants although both of them use similar machines and assembly lines.

Further, apart from using flexible automation, the Japanese employers have found other ways of reducing their 'fixed' labour costs. They have been getting round the regulars by employing 'temporary', 'subcontract' and other casual labour (in the main plants) to whom they can pass the adjustments of business depressions which have become very frequent, especially from the early '70s. Sub-contract labour is particularly noticeable in steel industry where it performs transport, maintenance, construction, repair, packaging and other accessory work and even operations intrinsic to steel-making such as moving molten metal from the furnace to the mill, and the treatment of ash, slag and oil waste.

The Japanese employers have also rapidly increased substitution of women for male workers to save on labour costs. Women workers, especially the older ones, have also been hired on part-time basis by small businesses including subcontractors as part of their move to reduce costs. In West Germany, apart from rationalisation via automation, the main firms have also employed (on a large-scale)'unskilled', cheap and docile women on piece rates to cut costs and increase flexibility[107]--the same aims as that of subcontracting.

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107. In this connection, see Marianne Herzog, From Hand to Mouth Women and Piecework (Introduction by Sally Alexander), Penguin 1980.

International subcontracting

There is a veritable explosion of knowledge on the phenomenon of international subcontracting; a detailed analysis is beyond our purview here. Its basic aim has been the same as that of domestic subcontracting--maximising profits by minimising costs and inflexibility in many ways as pointed out above.

The decision to go for it during the mid-60s or the late '60s was a consequence of the following circumstances. Those were the years when the postwar industrial boom met with the crisis of slackening of productivity, high wage rates and attendant costs, labour shortages, labour inflexibilities under the regime of Taylorism/Fordism, high costs of occupational and environmental health programmes etc. It was also the period of growing competitive rivalry under profit pressures between industrial countries; the rivalry was largely triggered off by the Japanese forays into the American and later European Market-territories. Cost-structure evaluation and make-buy decisions received a violent shake-up, forcing principal capitals (along with many of their domestic subcontractors) of each industrial country to meet the challenge by seeking lower costs via international subcontracting. Alongside these developments was a buoyant demand in the 'centre' for products involving labour-intensive manufacture. And the unit labour cost comparison for the same type of work as done in the 'centre'(Fordist work as also all that work that was labour intense in the 'centre') moved definitively in favour of the 'periphery' because of relatively cheaper labour with productivity levels comparing favourably with or even more than those in the 'core'.

Electronics industry has been supremely amenable to subcontracting because it enables the fragmentation of production processes into different stages in relation to the nature of technology--capital intensive, core technology and routine, labor-absorbing technology. There are several sub-assembly, and final assembly operations and labor-intensive finishing stages, many of which have been difficult to mechanise and so farmed out for international subcontracting in the context of fierce technological and price competition and profit squeeze. The industry is characterised by unprecedented rapid shortening of the life-cycles of products and technologies. In this connection, the practice of subcontracting is prized for spreading the risks and costs of constant retooling, rejuvenation and innovation and the impending threat of periodic obsolescence, cliff-hangers and roller-coaster type demand fluctuations, particularly in chip-making. International subcontracting in electronics is said to have accounted for roughly 56 per cent of total value of international subcontracting.[108]

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108. See "Report of the Seminar on Subcontracting and Complementation in..... ESCAP region", <u>Electronics Information and Planning</u>, op.cit.p.396.

As pointed out earlier, international subcontracting has occurred between 'centre-periphery' within the 'core' and between the 'core' and the 'periphery'. An example of interest here of the former case is the West German subcontracting of the production of complete television sets to medium-sized firms around Naples in Italy. These firms "use the German know-how and marketing services, not being big enough themselves to break into the world market. They, in turn, put out work to smaller firms in the area."[109]

Most of the international subcontract orders have flowed to the industrializing countries as reflected in the impressive export performance of the arch 'newly industrializing countries'(NICs)--South Korea, Taiwan, Hong Kong, Singapore, Brazil and Mexico. This process had a bandwagon effect, with many other small LDCs like Malaysia, the Philippines, Indonesia, Jamaica, Haiti, Morocco, Tunisia and so on becoming dependent on foreign trade. The overall result had been an excessively competitive "overkill" of magnanimous incentives to tempt tantalisingly the foreign investors in or make them dole out more or switch off subcontract orders from elsewhere. The generous concessions culminated in the numerical explosion of the capitalist dreamlands-free trade

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109. See Fergus Murray, op.cit.p.84

zones or export processing zones -- with suitably orchestrated conditions for setting up subcontract shops that establish links between multinational spaces or 'corporate borders'.[110]

More and more studies have found out that the host countries have actually become net losers due to international subcontracting in free trade zones. The much publicised claims to technological and managerial 'spill-overs' or linkages and 'foreign exchange earning' have been invalidated, especially in labour intensive, low skill branches. The foreign exchange earning "that the authorities boast of is... a heavily loaded concept. It reflects, and has been coined to justify, the reality of....rent-a-worker, rent-a-facility and rent-a-pollution cesspool business."[111] Employment creation is very unstable, Exploitation, especially of female labour and working conditions are horrible.[112]

Labour-intensive international subcontracting in the '70s became an "itenerant practice" with the principals

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110. See "Free Trade Zones: A Capitalist Dream" in Race & Class, Vol.22, No.2, Autumn 1980.

111. See Muto Ichiyo, "Free Trade Zones and Mystique of Export-Oriented Industrialization" in Free Trade Zones and Industrialization of Asia; Ampo Japan-Asia Quarterly Review (Special Issue) Tokyo 1977.pp.25-27 and passim.

112. For instance, see the moving documentation in The Plight of Asian Workers in Electronics, Christian conference of Asia-Urban Rural Mission, Hongkong, October 1982; Rachel Grossman, "Women's place in the Integrated Circuit", Manushi December '79 - January '80.

shifting their shop or order-flows altogether to areas with much lower wages and not subject to protectionist "quotas" etc. In recent times Japanese international subcontracting to the Asian 'periphery' and elsewhere has been particularly on the rise due to the situation of "endaka" (that is, over-valued yen).

New Technology and the future of subcontracting

New technology in terms of microchips, computers, telecommunications, software, and (light and touch) sensors has been increasingly applied in industrial countries to thoroughly redesign products, plants and organisations in order to win or survive the ruthless high-quality, low-price competitive race.

In the amazing field of product development, obsolescence has been deliberately built into the designs of products, especially electric appliances.[113] Designs have been simplified to achieve low-cost, low component count. This has reduced the number of soldering connections needed to interconnect the components in many electronics products. Hence low subassembly and assembly costs and the low labour intensity of production. Traditional mechanical and electromechanical items of high value have been replaced by low-value electronic components. Within electronic items, the traditional ones have been replaced by cheap, high-density integrated circuits (microchips or microprocessors) which are getting cheaper.

113. This point is made by John Kelley, op.cit.p.14.

The microchips reduce bulk, conserve energy, improve quality control, reliability, and versatality, facilitate easy repair (by taking one chip out and putting in another), spare material and labour costs in such a way as to remove altogether cheap labour competition, and finally increase user convenience and market appeal of products.

As the microchip makers invest massively and bring out 'super-chips', the products tend to become lighter, slimmer, shorter and smaller. Consequently, possibilities for big business are opened up. Markets are created constantly anew. All these trends have already had a negative impact on the 'buy-in' decisions of the top managements in as much as the standardized as well as subcontractable components and assembly operations are progressively eliminated. The tendency is towards integrated and automated manufacture, as some available evidence with respect to calculators, watches, television sets etc., points out.

In the manufacture of television sets, it is worth noting how the Japanese makers developed their outcompeting capacity. In the early years of colour television, the Japanese government allowed substantial reductions in high commodity taxes on all the colour sets incorporating microelectronic devices. This policy had two mutually reinforcing effects: first, it stimulated consumer demand; secondly, the competition it generated between the makers to beat the opponents in 'going solid state' created spirals of innovations in semiconductor devices as also in functional equipment design. The more the microchips used, the less the component count and cost became. This in turn opened up possibilities of automatic component insertion, which by late '70s rose to about 80 per cent of assembly and testing operations. The number of man-hours and power consumption per set came down drastically while the reliability of the end-product soared.[114]

Thus, the new technological trends on the above lines have altered the economics of production and started driving a nail into subcontracting's coffin. Nor is this all. Microchips are also put in the machines that are used to make them. The consequent electronic controlling of machine has shown the capacity of replacing almost all human activity in factories.[115]

With a microprocessor's cost becoming smaller and smaller fraction of the annual cost of a worker, and with the relative price of a robot or a computerised numerical control machine tool to a worker dropping remarkably, there has been a rapid diffusion of microchip-based capital equipment

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114. See the excellent account by Gene Gregory, The Japanese Propensity for Innovation: Electronics, Institute of Comparative Culture Business Series Bulletin No.86, Sophia University, Tokyo 1982, pp.19,26.

115. Ieuan Maddock, "Microprocessors,Luddites and their Economic Consequences", The World Economy, Vol.3,No.3, November 1980 p.306.

among big and small/medium firms in industrial countries. Such equipment have overcome the uneconomical problem of small-lot or even 'one-off' final assembly as well as parts-making by subcontracting or independent units under contemporary market conditions.

Such manufacture is integral to the larger system called "Computer Integrated Manufacturing"(CIM) or "Computer-aided Designing/Computer-aided Manufacturing"(CAD/CAM).[116] Its subsystem known as "Flexible Manufacturing System"(i.e. a combination of numerical control, robots, conveyors, automatic warehouse and computer) has been diffusing faster across the industrial spectrum.

The impact of such system on parent firm-subcontractor relationship will be open-ended. It can permit full internalisation (single-roof integration), complete subcontracting or a mix of both. Subcontracting possibility is very high because computer language will do away with the conventional way of issuing drawing or sample to a subcontractor. Instead, the geometric data and machine-tool programmes needed, for instance, to shape a part would be transferred electronically

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116. Under this revolutionary production system, lead time, inventory waste, material content and cost, labour content and cost, machine downtime, number of machine tools, average number of operations per part, energy consumption, total average processing time from raw-stock to finished product, overall overhead charges will all decline synergetically. The system's total size itself will shrink. There would be no labour-management troubles. Machine utilisation and product yield and quality will shoot up. The break-even point will collapse remarkably. The cost of manufacture per unit of output will fall and real rate of return on the system will increase. Above all, it provides short life options and facilitates better customer service.

within and across national frontiers (via microelectronically based satellites) to the subcontractor's computer. Orders from major customers or to subcontractors/suppliers could be electronically transmitted. This way, high quality conformance (i.e. faithfulness with which the product manufactured conforms to the design specifications) of subcontract work could be maintaned. The available evidence shows all the theoretical possibilities. Interestingly, mainstream corporations are tending to become just marketers by subcontracting the entire manufacturing to smaller units equipped with computerised production methods.[117]

There is no empirical evidence in detail as yet to find out the dominant trend affecting the future of subcontracting--domestic and international. Whatever scattered, including conjectural and conflicting, evidence is available, only indicates the ungeneralisable flux of manifold and contradictory moves on the part of the firms within and across national frontiers. The logic behind the international locational pattern has become very difficult to fathom. What is clear at least as of now are two tentative conclusions. First, in the light of the rapidly changing economics of production, it is highly plausible to expect a large share of offshore-subcontract-production to situate itself in and around final markets, not necessarily in the OECD countries; market orientation would be honed by innovation, not by cheap labour.

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117. See "Beyond Factory Robots", The Economist July 5,1986 p.57

Secondly, we can avoid the pitfall of believing in toto either of the two extremes of monocausalism--technological determinism on the one hand and the new international division of labour school of thought on the other. The former professes relocation back to North and/or business concentration and recentralisation of production, possibly under single roof, thereby making the business practice of subcontracting an outworn shibboleth of the bygones. The latter professes the theory that capital, using the old Babbage principle, would monotonously run after cheap labour in the peripheral world. Neither of the two is faithful to the disorderly reality, though.[118]

Subcontracting in industrializing countries

As for the progress in industrializing (developing) countries, the analyses of 'informal sector' have revealed, inter alia, the subcontracting relations in traditional and modern industries. Artisans, outworkers/homeworkers and wage labourers have been found to be interlinked by a series of subcontracting relations to petty, medium and large-scale (foreign and local) production. This discovery has substantiated the hypothesis that 'peripheral' industrialisation, whether exogenously or endogenously induced, does not destroy petty and small-scale producers but very much incorporates

118. On these lines, see the excellent paper by Dieter Ernst, "Automation, Employment and Third World, Case of Electronics Industry", Economic and Political Weekly, July 12 1986.

them into its dynamic[119].

The imperative for subcontracting in industrialising countries comes from its employment generation effects in capital scarce, labour surplus economies. Also subcontracting is expected to help to (a) reduce costs to the large units in the organised sector and (b) develop small-scale units. For the industry as a whole, it is expected to bring about economies of scale in production and increases in efficiency[120] through social division of labour and economy of specialisation, technological upgradation, competitive strength and above all flexibility of productive operations.

This is the 'image' created by the ideologues of

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119. We draw this hypothesis from Lucio Kowarick, "Capitalism and Urban Marginality in Brazil", in Ray Bromley and Chris Gerry (ed.), Casual Work and Poverty in Third World Countries, John Wiley & Sons Ltd., 1979, p.69 and *passim.*

120. The categories 'efficieny', 'performance', 'productivity' and 'effectiveness' are interchangeably used. But they can be distinguished. Efficiency is the difference between theoretical possibility and actual result. It depends on a) the utilization of a production line or machine, b) the efficiency with which raw materials are converted into final output, c) quality efficiency , that is, the percentage of products made passing the inspection standards, and d) the rate of production. Productivity refers to labour productivity(output per man). Performance refers to 'manufacturing cost per unit of output'. Reliability usually refers to delivery of product. On the ways of measurement of these, see Clews and Leonard, *op.cit.* pp.115-142.

what we may term "subcontractism"[121]. But the reality, in most cases as brought out by the detractors of subcontracting, does not correspond to the 'image'; large firms do parasitically siphon off surplus of the small firms and use them as "relief-valve". Asymmetry, unsymbiosis and instability characterize largely the reality of subcontracting in developing countries.

It has been maintained in some of the literature that subcontracting in developing economies remains "shallow" in comparison with its magnitude in industrial countries due to (a) lack of scope for 'industrial' and 'commercial' subcontracting in traditional industries and/or initial development of chemicals, food, agricultural or beverage based industries that do not involve a number of subcontractable intermediate items (b) slow growth of capital goods/assembly industries, (c) limited transfer of skilled personnel from 'formal' to 'informal' sector due to their shortage in 'formal' itself and the wide earnings gap in-between, (d) small domestic markets and

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121. The image is an idealised version of the Japanese style of subcontracting popularised by writers such as Susumu Watanabe as relevant for developing economies. He believes that "subcontracting can smooth the path of small enterprises and make them a suitable instrument for mass employment creation in developing countries that are committed to industrialisation"; "Subcontracting can lessen the obstacles to small entrepreneurs setting up business and can help them, once they are established, to survive and flourish."; Subcontracting is a tool of technology transfer domestically and internationally from the large to the small producers. And so on and so forth. But many claims for this style of subcontracting remain unproven. See Susumu Watanabe, "Subcontracting, industrialization and employment creation", International Labour Review, Vol.104, No.1/2, 1971 p.51, 71; Susumu Watanabe, "Technological linkages...", op.cit.

lack of cost-down competition between end-product makers and (e) preference by petty and small units to work for the highly profitable repair and replacement market and so on[122].

Such generalizations, however, need to be qualified. Their explanatory power can be questioned.[123] Besides, they

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122. On these generalisations, see Susumu Watanabe, "Technological Linkages...", op.cit. and OECD, Promotion of Small and Medium Sized Enterprises in Developing Countries through Collective Actions, Paris, 1969 etc.

123. Take, for instance, the celebrated "Barranson curve" argument in the case of automotive industry in developing countries. It states that cost penalty increases expone̋tially as domestic content ratio (i.e. the proportion of the product value that is accrued to domestic production) increases; this cost-up acts as a deterrent for the growth of subcontracting in these countries. However, such an argument seems to be a blind alley. For, after all, the 'Barranson curve' could have occurred in the early phases of Japanese automotive industrialisation too and yet a wide and deep subcontracting system developed there. In fact, Odaka's study points out that the East and Southeast Asian countries in late '70s can be roughly and not unreasonably likened to Japan in early '50s in terms of technology, market size, cost penalty, and international (price) competitiveness. So, the right question is : Why comparable subcontracting network has not developed and why are these countries still largely dependent on import of original as well as spare parts ? The answer to this lies largely in the character of capital ownership in these countries. That is, the potential firm in these countries, especially those largely dependent on foreign capital and trade, is often a foreign subsidiary or joint venture. In the cases where they are assemblers, a major objective of foreign capital participation has been precisely to import key parts etc., manufactured efficiently by the plants of their principals or of their principals' subcontractors situated in developed countries or even in developing countries. In the cases where foreign capital participation is to make parts and components, its major objective has been to reexport them to the final assembly plants of their principals or others wherever they are located. In either case, to energetically promote indigenous subcontracting would defeat a main objective of the parent firms' business in developing countries. On the comparison between Japan and Southeast Asian countries, see Konosuke Odaka, "Is the Division of Labour limited by the Extent of Market ? A Study of Automobile Production in East and Southeast Asia, Conference on Japan's Historical Development Experience and the contemporary Developing Countries: Issues for comparative Analysis -Phase II, International Development Centre of Japan, Jan. 6-9, 1982 (mimeo); Konosuke Odaka, "The Motor

cannot stand up to recent empirical research on traditional and modern industries in Asia and America Latina. A review of the studies in the Third World is not embarked upon here.

Review of literature (Indian context)

The hypothesis that increasing commercialisation(export or domestic oriented) combined with seasonal and annual demand instability has altered the production organisation of handicrafts and other traditional industries (not involving technical economies of scale) by way of putting out/ subcontracting in the Third World countries[124] finds investigative support in India too.[125] In addition, despite data limitations, and the findings of earlier studies that

124. On this hypothesis, see, for instance, Alice Littlefield, "The Expansion of Capitalist Relations of Production in Mexican Crafts", Journal of Peasant Studies, Vol.6,No.4 July 1979 and Hubert Schmitz, Manufacturing in the Backyard : Case Studies on Accumulation and Employment in Small-Scale Brazilian Industry, Frances Pinter,London 1982.

125. See Vincent Cable and Ann Weston, Indian Handicrafts and Handlooms--Production for the World Market, ICRIER, New Delhi, October 1983.

subcontracting was embryonic[126], there are now grounds to believe that much of the basis for the massive expansion of modern small-scale over the late '60s, '70s and '80s lies in industrial and commercial subcontracting connections between large and small firms as also between small firms not only in engineering[127] but also in other industrial branches.

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126. On some earlier studies, see the citations in C.S. Raman, "Development of Ancillaries", Economic & Political Weekly, May 19-26, 1984 p.M-65; in Rayaprolu Nagaraj, Subcontracting in Indian Manufacturing Industries --Analysis, Evidence and Issues, working paper No.192, Centre for Development Studies, pp.25-26; Also see Douglas Fisher, "A Survey of the Literature on Small-sized Industrial Undertakings in India", in Bert Hoselitz (ed.), op.cit.p.141; FICCI, Report on Seminar on Prosperity through Balanced Industrial Development, February 5, New Delhi,1970, p.72; Susumu Watanabe, "Reflections on Current Policies for Promoting Small Enterprises and Subcontracting", International Labour Review, Vol.110, No.5, November, 1974; S.T.Merani, "Development of Small Industries, Country Paper: India" in APO, Symposium on Small Business Development, Vol.1, November 9-16, Tokyo 1964 p.51; T.N.Lakshman, Problems and Prospects of Ancillary Industries in a Growing economy, A Study Based on the Survey of Ancillary Parent Establishments in Mysore, Rekha Publications, Bangalore, April 1970; and S.K.Basu, Alok Ghosh and Subrata Ray, Problems & Possibilities of Ancillary Industries in A developing economy A Study Based on the Survey of Ancillary Units in West Bengal, The World Press Pvt. Ltd., Calcutta 1965.

127. A votary of the proposition that subcontracting is not a widespread feature (between organised and unorganised sectors) in Indian industry except to some extent in engineering in Krishna Bhardwaj, "Towards a Macroeconomic Framework for A Developing Economy : The Indian Case", The Manchester School of Economic and Social Studies, Vol.47, No.3, September 1979.

Subcontracting of industrial and commercial types has been pointed out to have developed significantly in the 60s and 70s in such fields as automobiles, scooters, motor cycles, bicycles, tractors, earthmoving equipment, electrical equipment, entertainment electronics, industrial fasteners and fittings, intermediates and formulations(by 'molecular manipulation') for chemicals, drugs, and pharmaceuticals; rubber and plastic products, packing and packaging industry, and many consumer goods (garments, soaps, utensils etc.).[128] Also, labour-only subcontracting has risen considerably in chemical firms[129], basic industries (steel plants and coal mines), textile mills etc.[130] over the '70s.

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128. See FICCI, op.cit. p.27; R.Poornam, "Ancillary Industry Development", Lok Udyog, March 1980; J.D.Mehta, "Some Issues on the Development of Ancillary Industries in India", in BCCI, Role of Organised Industry in the Effective Development of Small-Scale Industry, Bombay 1979 p.91; D.K.Sawant, "India's Small Industries Sector : A fresh Look at its Composition", Small Industry Bulletin for Asia and the Pacific, No.13, 1976 p.36;

129. Bharat Bhushan, "Ancillarization : A New Production Strategy", Business India, January 16-29, 1984 p.79

130. See A Group of Researchers, "Contract Labour in a Steel Plant: A Study for a Trade Union", Economic and Political Weekly, November 1986 p.M-123-136; On contract labour in Bombay textile mills, see AWDI-FES, "The State of Unorganised Labour", Seminar papers, Asian Worker Development Institute, Orissa, February 24-27,1983,p.7; at the ports, railway yards, fertiliser companies, See Sujata Patel, "Contract Labour and Public Interest Litigation", Economic and Political Weekly, December 17, 1983, pp.2151-52; Also casual labour is increasingly employed in engineering industries. See AWDI-FES, op.cit.

From the studies by Goyal, Rao and Kumar[131], Bhushan,[132] Harris,[133] Streefkerk,[134] Van der Veen,[135] Cartillier,[136] Papola and Mathur,[137] to mention a few, some salient findings can be noted. First, there are cases of subcontracting and resubcontracting chains : big to medium to small to small. There has been a strong tendency towards the formation of split units. It is no more a secret that a number of these units are the('benami') properties of the families, relations and business associates of the management of the big and medium(umbrella) units. A number of them also have come into existence due to small units splitting into smaller units. Most of these split units are subcontract shops or parallel facilities (alternative supply sources). The parent firms have

131. S.K.Goyal, K.S.Chalapati Rao & Nagesh Kumar, Small Scale Sector and Big Business, The Indian Institute of Public Administration, New Delhi, February 1984.

132. Bharat Bhushan, op.cit. This study is based on detailed interviews with businessmen in large and small sectors.

133. See John Harris, "Character of an Urban Economy "Small Scale Production and Labour Markets in Coimbatore", Parts 1 & 2 in Economic and Political Weekly, June 5 & 12, 1982.

134. Hein Streefkerk, "Too Little to Live on, Too Much to Die on Employment in Small Scale Industries in Rural South Gujarat", Parts 1,2, & 3 in Economic and Political Weekly, April, 11,18 & 25.

135. Jan H Van der Veen, "A Study of Small Industries in Gujrat State, India", Occasional Paper No.65, Department of Agricultural Economics, Cornell University, May 1973.

136. Michel Cartillier, "Role of Small-Scale Industries in Economic Development Irrigation Pumpsets Industry in Coimbatore", Economic and Political Weekly, November 1, 1975.

137. T.S.Papola and R.S.Mathur, Inter-sectoral Linkages in Manufacturing: A Study of Metal Engineering Industry in Kanpur, Giri Institute of Development Studies, Lucknow 1978.

actively supported their split units with contracts for supplying materials, components, semi-finished and finished products. A number of whole-component or product or subassembly subcontractors (whether controlled by umbrella units or not) have resubcontracted less sophisticated, single operations (like tapping, galvanization, polishing, welding, painting, electroplating, plastic moulding, sheet metal work etc) to other small subcontract shops. The split units serve the motives of the parent firms/subcontractors for expanding, and reducing costs by bypassing labour and fiscal legislation, avoiding labour concentration and troubles, taking advantage of various priveleges (eg. reservation of items), exemptions (excise, tax etc) and forms of aid granted to the small sector by the government, for diversifying product range and for ensuring timely supplies without any hitch.

Secondly, there is a tendency of skilled workers/engineers/technicians of big shops leaving on their own (or on encouragement from parent units) and setting up subcontract businesses. There are instances of big shops helping them with second hand machinery. Harris's study indicates material supply from parent units to subcontractors. Thirdly, some subcontractors could become own-account production units and achieve rapid growth but a majority of them do not follow such a path. And finally, product markets--regional and national--are competitive.

As regards technological linkages that follow subcontracting, the contrast between Papola and Mathur's findings and Sanjaya Lall's is quite remarkable. This is due to the difference in the degree of technological sophistication between the industries. In Kanpur's metal engineering industry, the most generally subcontracted work consists of simple processes requiring little sophistication and skill. Hence there is the lack of technological linkages. However, in cases where some big enterprises have sponsored a few small enterpreneurs, they have subcontracted sophisticated processing and provided them with equipment and financial assistance.[138]

Lall's study points out that the pricing linkage is 'combative', the outcome being worse for small subcontractors unlike for larger and independent suppliers (serving the whole industry). The low prices thrust upon small suppliers are considered by parent firms as a compensation for the

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138. Lall classes technological linkages into three types: low-tech (input specifications and quality controlling), medium-tech(joint development of component designs, guidance regarding production techniques, plant layout, material testing, labour training, purchase of capital goods etc) and high-tech (in-house designing and development work to suit the capabilities of suppliers). These linkages in automotive industry are weak with suppliers based on dissimilar technology (eg.in electrical, glass, rubber and paint production). There is a two-way linkage between assemblers and suppliers based on similar technology (eg.in making pistons, fuel injections, fastners etc). The linkage between assemblers and small subcontractors is one-sided.

initial high 'search costs' and the costs of 'guidance and assistance'.[139] In connection with pricing, an important finding is that in commercial subcontracting, the parent firms (wholesalers and manufacturers) procure items from small uhits (in organised and unorganised sectors) at very low rates and then price them high in the domestic market so as to realize higher profit margins than those that would materialize through their own production[140]. Here we may qualify that the large firms may not enjoy huge mark-ups on the goods so lifted for export market due to fierce competition.

139.There is also what is called 'distributional linkage' between assemblers and suppliers. This is about the arrangements for servicing the highly profitable replacement market. Lall found a variety of revenue sharing arrangements depending on the size and bargaining position of suppliers. But ideally, the assemblers would like to capture all the profits realizable in the spares market by buying the spares from the suppliers at the same price as that of the original parts and selling them under their own labels on the open market. Similarly, the suppliers would like to sell the original parts freely as spares under their own labels with endorsement of the assemblers.

140.See A.N. Bose, Calcutta and Rural Bengal; Small Sector Symbiosis, Minerva Associates Publ.Ltd., Calcutta 1978 pp.111,118; Annapurna Shaw, "The Informal Sector in a Third World Economy: A Case Study of Calcutta, India", Bulletin of Concerned Asian Scholars, Vol.17, No.1,1985 pp.43,51; Goyal, Rao and Kumar, op.cit.pp.115-118; Timir Basu, "Calcutta's Sandal Makers", Economic and Political Weekly, August 6,1976.

Problems and other features of Indian subcontracting

The available literature throws considerable light on the "unsatisfactory" aspects of subcontracting in Indian industries. From the parent firms' side, the constraints are as follows. First, the role of public sector enterprises in developing ancillaries or ancillary industrial estates has been attacked and found to be a failure in general[141], although the concept of ancillarization has been recognised by the government as integral to the industrial development process and the state units have been expected to play exemplary role in that regard.[142] It is said the public units in general follow minimum purchase formalities and limit themselves to a few ancillaries proper while having several informal subcontractors because of the 50 per cent offtake-rigidity imposed by the official definition of an 'ancillary'.

Secondly, parent firms in general do not offload technologically advanced items to firms they cannot control or monitor closely. Therefore, ancillary work tends to be of

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141. In this connection, See Bindoo Pandhi, "The Ancillary Relationship - A case study of a public sector unit and its Ancillaries", mimeo (no date). This is about HMT, Pinjore.

142. See Planning Commission, Third Five Year Plan : Progress Report 1961-62, 1963.p.127 and the subsequent Plan documents; Bureau of Public Enterprises, Guidelines for the Growth and Development of Ancillary Industries by Public Sector Enterprises, Ministry of Finance, Govt.of India, 1978.

low technology. This is also to do with lack of loyalty between the parent and ancillary. (3) Thirdly, there are cases where the cost of small units is not less than the in-house cost of big units, possibly because of lack of required machinery or low-price, high quality raw materials etc. Or, cost-quality ineffectivity is attributed to reservation of markets for subcontractors. Alternatively, the high cost may be simply due to lack of minimum efficient scales of the subcontractors concerned. Fourthly, many ancillaries and subcontractors are reported (4) to be faulting on delivery schedules. Fifthly, (5) and more importantly, the growth of subcontracting has suffered because the present definition of job-work does not permit free flow of raw materials and components to subcontractors and of semi-finished items back to parent firms. The to and fro transactions are excisable and subject to sales tax etc., leading to the cascading effect of multi-point levies.

From the subcontractors' side, the constraints are many. They do highly risky operations dependent on the growth of large units. A 5 per cent fall in the growth of the large is said to result in a 100 per cent fall in demand for ancillary items. For example, when the 1974-75 auto recession broke out, and many big units downed their shutters, several ancillaries sank.

The subcontractors have undefined workload and volatile manufacturing schedules because of irregular and erratic and even 'one-off' work orders, shortage of power or essential rawmaterials, obsolescence in their methods of production and quality control in relation to technological progress at the parent firms, lack of adequate technological support from parent units, lack of mass production programmes at the parent units, credit crunch on parent firms, product market fluctuations confronted by the main units, rejection of goods and so on. The relationships are not long-term and durable.

Their cash-flow management is often bad because of delays of payments from the parents. This delay may be deliberate or due to credit crunch or product market downturns on primary firms. Whatever be the reason, the working capital (wages, raw material costs, electricity bills, excise duties and bank interest debits) of subcontractors is blocked. In this milieu, they suffer from de facto credit squeeze by banks. And if they manage to borrow from banks by discounting bills, they suffer additionally from the penal interest rate on this borrowing which tends to wash away their low profit margins. If the ancillary stops supplying to the parent, the latter will go to others and repeat the same practice till it is able to pay and come back to the former ancillaries. The point is that the availability of easy credit at 'appropriate time' seems to be a sheer myth.[143]

143. See, in this connection, "Ambattur:Industrial Scene", (Special Report by N.Chandra Mohan) The Hindu, August 20, 1985.

Multi-sourcing by parent firms leaves the subcontractors with no economies of scale. Besides, there is no 'fair price' in this game. Parent firms do not usually grant price increases corresponding to increase in input costs of subcontractors. Cut-throat competitive bidding between smaller subcontractors leads to below-cost quotations to grab work orders. The tender system practised by several state units and departments is said to militate against the health of ancillaries. The mushrooming middlemen (in the form of non-manufacturing 'bogus' units) appropriate the orders by making bids or tenders at cut-throat quotations and pass on the orders to jobbers. This 'middleman-jobber clique' system indirectly expropriates real small investors who just cannot cope with the price-warfare. There is no clue as to how widespread this tender-contract system is today.

The subcontractors suffer from delays in inspection of goods and acceptance by parent firms. When such delay happens, there seems to be no sharing of inventory holding costs between the parents and subcontractors; the parents perforce force their suppliers to bear these costs.

Most of the suppliers, especially in ancillary industrial estates, are heavily dependent on one parent firm. Thus, their survival and collapse is neatly interwined with the fate of the parent firm[144].

Statement of the Problem

It is clear from the foregoing discussion that an area worth further exploration is the problem posed by the dominant idea that progressive concentration and centralisation of capital inevitably leads to physical concentration of production with huge amounts of fixed capital and workers in particular, at any given site and that petty and small forms of production are remnants of a disappearing 'relatively inefficient', traditional backward sector of production. A growing body of evidence has challenged this belief. For, the process of capital accumulation has also been the process of the integration of more modern forms with less modern forms, making it complex to account for the dialectic of vertical integration and disintegration happening simultaneously. The small firm has persisted with weed-like tenacity. This stubbornness has been to a considerable extent associated with two specific ways of productive decentralization, namely putting out/subcontracting by large and small factories and larger factories splitting up their production cycles between different smaller plants (and again subcontracting).

144. It is interesting to note that the Ramanujan Committee, set up by the government to look into the various difficulties and problems of the small ancillaries/subcontractors vis-a-vis the big, submitted its report about 1978. But no follow-up action has materialised, at least on paper in terms of anti-abuse/misuse legislation against the big units on the lines of the Japanese legislation. That this Committee inquired into this realm has been mentioned in Sibnath Bhattacharjea, Rural Industrialization in India, B.R.Publishing Corporation, Delhi 1980 p.19.

Since changes in production organisation occur ultimately at the level of particular firm/plant, the above macro-problem can be restated at the micro-level. Why do firms initiate contractual relationship with other firms or splitting-up themselves instead of vertically integrating their operations, given the transport costs, the difficulties of achieving well co-ordinated quantity and quality control over the work farmed out for subcontract, and the capabilities of the giver of the contract for technical advance had the work been internalized ? The question has many corollaries. For instance, if the giver's essential motive is to minimise costs and maximise flexibility of productive operations (especially in relation to product demand fluctuations and utilization and expendability of labour), then is it possible to make an analysis of contractual relations most convincing by showing the increase in profitability and flexibility to the giver of the contract ?

With regard to flexibility, can the following question find an empirical answer: " Do large firms which subcontract out work cut their contracts with outside suppliers before they cut their onw internal costs when product demand falls and subcontract out work before incurring internal costs when demand rises ?"[145] Further, under what conditions does

145. This question is raised by Andrew Friedman, op.cit. p.127

commercial subcontracting become more profitable and flexible than industrial subcontracting ? How does the contractual relationship affect the taker of the contract ? What conditions make such relations mutually reinforcing or unsymbiotic to the detriment of the takers ? The dominant economic theory at the micro-level is hardly tenable; it has largely failed to recognise contractual relationships between firms, leave alone analyse them as power relations.

The above problem at the macro and micro levels cannot be dealt with unless the evolution of industrial organisation is re-examined thoroughly in historical perspective across the industrial spectrum in different countries. And this task cannot be realistic unless it proceeds keeping in view the similarities and dissimilarities of such transformable aspects of industrial production system as the nature of technology in relation to various products, their intermediate products, and various production operations; the impact of new technology and new types of product market competition on the prevailing forms of production; industrial structure, the degree of inter-firm competition; industrial relations, labour process, managerial strategies, labour market segmentation; stage and strategy of industrialization; state policies and regulation etc. In order to avoid the pitfalls of sweeping generalisation, the above inquiry would be meaningful if only it is industry-, firm- and product-specific.

Objectives of the study

In this wider context, this study aims at analysing the organisation of production of a particular 'integral' product, namely television set manufactured by a leading firm in the Indian electronics industry. It examines 'industrial' and 'commercial' subcontracting and splitting-up of production cycle by the main TV-making plant of the parent firm.

More precisely, it seeks to analyse subcontracting in terms of (a) the nature of work farmed out for subcontract and the work done in-house by the parent firm including the question as to whom the work is given and under what terms and conditions; (b) driving forces of subcontracting (in terms of technological parameters, cost-structure, demand instability, labour-management relations, inter-firm and product competition, the role of the government etc); (c) effects on the parent firm (in terms of cost-minimisation, profitability, market penetration, flexibility etc);(d) effects on small-scale subcontractors in terms of work order support, technological spin-off (by way of product/ process improvement, technical training, skill promotion etc), survival and commercial viability, working conditions/labour arrangements/ payment systems etc; and (e) problems and constraints as experienced by the parent firm and subcontractors that impede the growth of 'successful' and 'symbiotic' relations.

Methodology of the case study and data base

The questions posed above are examined with the help of a case study of the subcontracting relationship between the main TV-making plant of the Kerala State Electronics Development Corporation (KSEDC, popularly known as Keltron) and its subcontracting-in firms. The choice of Keltron was governed by its physical proximity. Besides, it is considered to be a 'successful' public sector undertaking in electronics.

The methodology comprises (a) an examination of the secondary literature (published and unpublished reports) concerning the parent company (Keltron) in general, and its TV-making plant in particular, (b) field study at the parent firm's main TV plant, and (c) field study of all the subcontracting-in firms (numbering 28) situated in and around Trivandrum city and supplying items to the main TV plant.[146]

The survey of the subcontractors was conducted in two phases. The first phase consisted of a pilot study of 9 units in the second-half of 1982. The second phase covered 19 units in the second-half of 1983. Some of the units covered in the pilot survey were revisited in the second phase and some units of the two phases were resurveyed in early 1984 in order to update information from them. The owners and/or supervisory staff and in some cases a few

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146. The names and addresses of the 28 units are not divulged so as to ensure confidentiality as requested by most of them.

workers too were contacted at the workshop/factory and were solicited for quantitative as well as qualitative information over time.

The survey also involved periodic visits (up till March 1984) to the main factory and to General Sales Division, Keltron and Keltron headquarters in order to interview the personnel concerned at the Ancillary Purchase & Development Section, Costs & Accounts section, workers, industrial engineers, supervisors, executives belonging to TV production, planning, inspection, quality control, design and engineering development and marketing departments and the then Chairman and other top-management officials of Keltron. Thus, the observations of the 28-unit-survey were constantly cross-checked so as to acquire as far as possible a reliable and objective picture of the nexus between the main TV factory and its suppliers.

The field-work was based on a detailed and rather lengthy questionnaire to gather information from the sub-contractors. The information collected included such aspects as (1) entrepreneurial background, (2) capital structure and modes of financing of the unit concerned, (3) product/operation, capacity and its utilization, machinery and equipment installed etc., (4) current expenditure (on prime costs and working overheads), (5) production and sales/revenue figures and performance over time, (6) terms of payment set by the main factory, unit's share in the main plant's purchase by product/operation, extent of delay of payments from customer(s) and unit's cash-flow situation, price-fixation procedure and assessment of current profit margins etc., (7) unit's relationship with the main factory (work-order-flow, supply of materials etc. by the main plant, unit's materials management, testing and rejection/acceptance of product/ operation, unit's assessment of the main factory's ongoing 'guidance and assistance', if any etc., (8) unit's employment, work organisation, labour arrangements, payment systems and the earnings of the employees, and (9) unit's overall assessment of the current subcontracting arrangement with Keltron's TV plant and future plans.

It must be stated that information, especially the quantitative type, could not be obtained meticulously on some of the issues. These included average cost of production by the main TV plant (actual or simulated) with its break-up, and the same at the subcontractors for different items/operations that have been subcontracted. The reasons are obvious. The very small subcontractors did not maintain records. And those which did, refused access to their data-files and accounts. It took on an average four to five attempts to identify the units and get an idea of their economics. As such, the case study suffered from the shortcomings of uneven data collection; the amount and reliability of the information collected varied between the units.

Furthermore, there are problems with the statistics gathered about Keltron and its TV operations from three sources: Annual Reports (which are published), compilation by the Market, Planning and Co-ordination Group of the General Sales Division, Keltron (which is unpublished) and Costs & Accounts Department of the TV making plant (unpublished). There is discrepancy between the figures not only in the same source but also between the three sources even for comparable product groups/individual product category. Nor is this all. The parent firm too did not seem to maintain meticulous records about its make-buy operations; even if it did, it denied access to them in detail.

<u>Chapterisation Scheme</u>

This chapter (Chapter 1 : Introduction) presents the scope, and method of the study. The scope has been derived from a review of the vast literature on subcontracting at theoretical level in various schools of thought (Neoclassical, Marxian, Neo-Marxian and others) and at empirical level in the developed and developing countries. On drawing close parallels between the subcontracting systems in the 19th and 20th centuries, the review outlined, in historical perspective, the conditions under which subcontracting emerged as a significant phenomenon and established complex relationships between subcontracting-out and subcontracting-in firms. The complex relationship between technological progress and subcontracting is also briefly touched upon. In particular, the problem of subcontracting as revealed by studies in India have been outlined and the scope of the present study has been focussed in that milieu.

In Chapter 2, structural change in terms of the integration of small-scale production into large-scale production in the Indian context is discussed. This is followed by an analysis of the size-structure, cost-structure, and the scope for subcontracting in electronics industry. The study then moves on to the television industry analysed in terms of its cost-price structure and the imperative for subcontracting.

On briefly sketching Keltron as a leading electronics firm, its make-buy policy in general and in relation to its TV-making plant are examined in Chapter 3. The rationale for industrial and commercial subcontracting as also for its splitting up is highlighted.

In Chapter 4, the findings and observations of the survey of subcontractors as also the factors governing the survival and commercial viability of the subcontractors are analysed.

In Chapter 5, some inferences are drawn about subcontracting practice in the light of the specifics of the case study against the backdrop of the knowledge based on the available literature.

CHAPTER 2

SUBCONTRACTING IN INDIAN MANUFACTURING

Introduction

This chapter sketches out briefly industrial structure in terms of subcontracting linkages in traditional and modern industries in India. This is done in four sections. Section 1 deals with the rise of subcontracting in traditional industries ~~in general.~~ Section 2 points out subcontracting as the basis for much of the expansion of the modern small-scale industry. Section 3 focusses on the electronics industry. Here a profile of the industry is drawn and it is followed by an exposition on the factors underlying the scope for subcontracting. Section 4 brings into sharp focus the television industry and examines its high-cost structure, imperative for low-cost rationalization and implications for subcontracting.

Section 1: Subcontracting in traditional industries

On the eve of independence, Indian industry was dominated by "lower forms of production".[1] The 'semi-natural'

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1. These forms of production accounted for 75 per cent of the total number of persons employed in industry and for some 60 per cent of industry generated net income. See G.K.Shirokov, "Industrialisation and Changing Pattern of India's Social System", Indian Left Review, Vol.4, No.12 October 1976, p.14; Also see A.I.Levkovsky, Capitalism in India; Basic Trends in its Development, People's Publishing House 1972, p.419 and passim.

cottage industries (khadi and rural industries) as also small mechanised units (employing under 10 workers) registered high growth rates in terms of labour absorption.[2] There is evidence to point out that the growth process of handicrafts had been significantly based on external sub-contracting ('industrial' and 'commercial') and internal contracting systems.

During the pre-1914 period, the widening of markets (domestic and foreign) broke the direct link between artisans and consumers; the former became dependent on middlemen, who often combined the functions of raw material supply and end-product marketing and co-ordinated social division of labour and specialisation. The middlemen did this in such a way that they could squeeze the artisans on the one hand, and find a hedge against demand instability on the other.[3]

In the inter-war period, the weavers were subject to merchant-usurer exploitation. Also, differentiation within weavers led to exploitative dependency of independent weavers on the newly rich fellow weavers who took over supply and

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2. G.K.Shirokov, op.cit. pp.46-47; on their growth in the '70s, see Cable and Weston, op.cit. pp.2/7,2/237.

3. Ibid.p.3/17; Also see D.R.Gadgil, The Industrial Evolution of India in Recent Times 1860 - 1939 (Ch.13),Oxford University Press 1971. The crafts in which such organisation occurred were art metal (brass and copper) ware, hand printing, handloom (cotton and silk) weaving, wire and tinsel or gold and silver thread pulling, wood and ivory carving, carpet-making, shawl-making etc.

marketing priveleges and converted the former "into domestic workers of a dispersed manufactory."[4]

Even today, the increasingly commercialised production of handicrafts[5] is predominantly based on subcontracting to household units. The days of independent artisans are practically over; units working on own-account are fewer. Now the order of the day is enforced by middlemen, agents or subcontractors; they act on behalf of manufacturers, merchants or exporters by providing the artisans with raw materials, tools, designs, miserable wages and an outlet for their products.[6]

There is a view that the putting out/subcontracting practice based on traditional technology is incompatible with the rigourous demands of the export market in terms of large volumes, punctual delivery and strict and consistent quality control. In fact, a main criticism of subcontracting in Indian handicrafts is that it has not permitted upgradation or product innovation to meet the demands of export market. The persistence of this system nevertheless indicates that it

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4. Levkovsky, op.cit. pp.206-209

5. These are handlooms, carpets, art metal ware, handprinting, gem cutting, lace-making, chikan industry, dyeing and jari-making.

6. For details, see the excellent account in Cable and Weston, op.cit.

has considerable advantage over the integrated factory system.[7]

The compulsion to modernise the process and standardize the product and improve quality control and prevent embezzlement of materials has ushered in worksheds or factories or'kharkhanas'[8], but they are numerically insignificant. Moreover, there are many instances of factories closing down or reverting to subcontracting system. The decisive trend is towards breaking the semi-urban handicraft factories into small units employing less than 10 people in order to circumvent the rigour of Factory Acts and other legislation and the militancy of organised labour. In some cases, the splitting-up has been achieved ingeniously via internal contracting.[9]

The traditional industries in Kerala--coir,cashew, handlooms, beedi, fish processing, vegetable and fruit processing--exemplify the reverse process of factory system

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7. Inspite of high valued items involved and very high rejection rates, putting out persists in the gemstone industry! We may note that the question of inconsistent quality is related to fierce competition in production for export; too many intermediaries and excessive competition may have reduced the mark-ups on the one hand, and lowered quality in the process of making goods cheaper on the other.

8. In some cases such as 'dhurries', the rawmaterial is too bulky to permit production on putting out in weavers' cottages.

9. According to the Factory Act, a factory has to provide basic facilities to the workers. It is subject to inspection by government officials. If it employs 10 or more workers, it has to pay bonφuses. If it employs 50 or more workers, the manufacturers have to contribute to provident fund (PF) on workers' behalf. In Kerala, a factory has to pay bonus,PF, daily allowance, employees social insurance (ESI) including medical aid and offer paid casual leave. On these lines see Cable and Weston, op.cit.

turning into decentralized system of production in the unorganised sector via subcontracting. When we look at the dynamics of these trades chronologically from the second-half of the 19th century up till now, we can notice three distinct phases. In the first phase, factories or manufactories characterized the mode of production. In coir, cashew and fish processing, the factories also practised internal contracting. In plantation industry, there prevailed labour-only subcontracting. In the second phase, we find a partial or complete shift in processing from factory level to cottage/domestic level as a reaction to the radical working class movement and to escape from labour laws and to minimise costs and supervision time in the context of stiff competition. In the third phase (especially from the mid-'70s), we find the transplantation of production (eg. coir, cashew and beedi) on mechanised basis or on subcontract to Tamil Nadu where lower wages and weak tradeunionism prevail.[10]

In cotton textile industry, the government has frozen the capacity (loomage) of large mills and allowed uncontrolled powerloom expansion. It is now no secret that the mill

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10. For details, see P.M.Mathew, "Exploitation of Women's Labour: An analysis of Women's Employment in Kerala" and U.Kalpagam, "Women and the Industrial Reserve Army -- A Reappraisal" in Social Scientist 149-150 October-November 1985; Also see T.M.Thomas Isaac "Class Struggle and Structural changes: Coir Mat and Matting Industry in Kerala 1950-80", Economic and Political Weekly, Vol.17, No.31, July 1982.

owners have been subcontracting to powerlooms to overcome the freeze on expansion.[11] This capacity subcontracting is also economical to the mills because powerlooms enjoy cost advantages over both mill looms and handlooms. They have low capital costs and low overhead and labour costs.[12]

In garment making, subcontracting has occurred not only within factory and non-factory sectors but also between them. Similarly, in the production of hosiery, sportsgoods, leather and footwear, match making etc., the manufacturers and traders have taken recourse to decentralisation via subcontracting.[13]

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11. See Cable and Weston, op.cit.p.5-9; R.Nagaraj, op.cit.p.17 Note that the Bombay mills could also minimise revenue loss despite the largest strike in history involving more than 2,50,000 workers during 1982-83 by subcontracting to the powerlooms in Bhiwandi and elsewhere. Personal communication with Prof.Jan Breman (Institute of Social Studies, The Hague) who had done field work in Bhiwandi and with K.Bharatan (Ph.D work on handlooms in progress), Madras Institute of Development Studies. The latter pointed out that subcontracting between mills and powerlooms did not prevail in Southern India; Also see Bharat Bhushan, op.cit. p.81.

12. Low capital costs because only power needs to be added to the traditional looms; and low labour and overhead costs because they operate in the small sector beyond the tentacles of labour legislation and unionisation.

13. See U.Kalpagam in Social Scientist 149-150, 1985 and U.Kalpagam, "Labour in Small Industry: Case of Export Garments Industry in Madras", Economic and Political Weekly, Vol.16, No.48, November 28,1981; Also see "Enterprise: A Smashing Success" in Business India, April 23-May 6, 1984, pp.99-101; "Hosiery Strike" in Frontier, June 23,1984 pp.11-13; "Hosiery units in Knots" in The Hindu, July 8, 1984, p.19; APO, International Subcontracting ....., op.cit.p.92; A.N.Bose, op.cit; Timir Basu, op.cit.; Discussion with R.Vidyasagar, project Associate, Sivakasi child labour project at the Centre for Development Studies; also with Y.John (M.Phil Student, CDS) who took me to a tiny match unit at Thuckalay in Kanyakumari, TN.

Thus, it could be said that subcontracting in various forms operated in the distant past and that, interestingly, it operates significantly even today in the traditional manufactures.[14]

Section 2: Subcontracting in modern industries

Subcontracting has emerged as a significant aspect of structural changes in modern industries as well. This becomes partly evident from the analysis of the growth of modern small industry.

Growth of modern small industry

A Characteristic feature of industrialisation in modern times is the modern small-scale industry which has close links of the technical or input-output kind with the large-scale industrial sector.[15] The 1950s and early '60s during which India set out inward looking 'planned' industrialization, saw a sustained industrial boom. This period saw the consolidation of modern large-scale industry, especially engineering industries. Also, it saw the rise of modern small industry

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14. The categories 'traditional' and 'modern' seem to pose questions of grey semantics. For example, export garments and sports goods are considered 'non-traditional' by some, plausibly because they are new trades whereas handicrafts are 'traditional' in historical sense. But handicrafts too are subject to modernisation and innovation.

15. The modern small units could be markedly capital intensive too. That it has been so in the Indian context is mentioned in K.K.Subramanian, "Linkages of Small-Scale Industry; Implications for Employment Generation", The Indian Journal of Labour Economics, Vol.19, No.3-4, October 1976-January 1977 p.80; Krishna Bharadwaj, op.cit.; Susumu Watanabe, "Reflections on Current Policies for Promoting Small Enterprises and Subcontracting", International Labour Review, Vol.110, No.5, November 1974, p.413.

producing various equipments/goods or parts for them.[16] More importantly, while the large-scale sector is considered to have 'stagnated relatively' since the mid-60s, the growth of modern small sector has been spectacular.[17] The proliferation of small units is also said to have created a tendency in Indian industries towards a "long tail" in the market structure.[18]

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16. Unregistered as well as registered modern small units grew in the fields of electric appliances and apparatuses (eg.fans and electric motors), light engineering(eg. sewing machines and bicycles), transport equipment , machinery (all kinds), chemicals and chemical products etc. See S.T.Merani, op.cit; Levkovsky, op.cit.pp. 421-424 and passim.

17. See Cable and Weston, op.cit. p.2/7,2/237; L.R.Upasani, "Development of entrepreneurship in India", Small Industry Bulletin for Asia and the Pacific, No.13, 1976; Ram K. Vepa, Small Industry in the Seventies, Vikas Publications, 1971 p.25; Nirmala Banerjee, "Is Small Beautiful ?" in A.K.Bagchi and N.Banerjee (ed.), Change & Choice in Indian Industry, CSSS, Calcutta 1981; BCCI, Role of Organised Industry in the Effective Development of Small Scale Industry, Bombay Chamber of Commerce and Industry, Bombay 1979; Laghu Udyog Samachar, February, March, September and December 1979; Jairus Banaji, Accumulation and Exploitability--Some Notes for a Study of Industrial Capitalism in India, UNITAR Conference, New Delhi 1980 (mimeo): R.Nagaraj, op.cit. pp.35-40; FICCI, Workshop on Ancillarization, July 8,1981 p.21; J.C.Sandesara, "The Small Industry Question: Issues, Evidence and Suggestions" in Bagchi and Banerjee (ed),op.cit.

18. That is, the long-tailed industries are those having a small number of large firms with a large number of small firms--all final product firms--which compete in the same market or operate in different market segments. They are dyes, soap, diesel engines, machine tools, cranes and hoists, motors and transformers, apparel textiles, tobacco(cigarettes), sugar, speciality chemicals(pharmaceuticals)etc. By contrast, the short-tailed industries are oligopolistic type where small firms are fewer or absent like soda ash, explosives, machinery(metallurgical, cement,textile,mining etc),generators,commercial vehicles and cars etc. The difference in the industry type is conjectured to be in terms of economies of scale, R&D intensity,supply of technology to smaller firms,supply of basic rawmaterials(eg.salt in the case of soda ash)etc. See Ashok V.Desai,Market Structure and Technology:Their Interdependence in Indian Industry, NCAER, August 1982 pp.26-29.

The euphoric statements in the literature on the growth of the small-scale, however, need to be qualified. The growth estimates are rough, and largely conjectural; they do not make adjustments for 'ghost births'('bogus' units) and the incidence of mortality.[19] Further, the alleged efficacy of the munificent promotional and protective policies of the government towards small industry growth[20] has been questioned. While the state policies have atleast made small industry an entry-easy sector, the policies themselves have been contradictory. And many small units owe their origin and growth to factors independent of them.[21] Furthermore, much of the dynamism of

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19. See A.Nag, "Small Industries: Aspects of their Mortality", Economic Times, October 1980,pp.4-5. This article is based on the first exploratory survey of mortality undertaken in India during 1975-76 in A.P., Kerala and Karnataka. Besides, we must note that rather than new units coming into existence, many older/existing units have been coming under the umbrella of the small sector because of frequent upward revisions of the size of small units (in terms of the original value of plant and machinery, which is now pegged at Rs.35 lakhs). To that extent, growth is spurious.

20. It is tedious to compile here the long list of government steps towards small industry growth. See G.P.Mishra and P.N.Mishra, "Government Policies for Promoting Small Scale Industries", Laghu Udyog Samachar, June 1979 pp.10-15; Nirmala Banerjee in Bagchi & Banerjee (ed.), op.cit.p.287; BCCI, op.cit; J.C.Sandesara, "Incentives and their Impact: Some studies on Small Industry", Economic and Political Weekly, November 27,1982; Cable and Weston, op.cit.; L.R.Upasani, op.cit.

21. See V.S.Mahajan, "Small and Tiny Units: Impact of Government Assistance", Economic Times, October 2, 1980 p.4-5; Goyal, Rao and Kumar, op.cit.;

the small-scale has been due to the concealed expansion of big and medium capital in the small sector in the form of 'split' units. Even the small units (sans control by the big) have been expanding similarly so as to continue to avoid labour and fiscal legislation and to qualify for the governmental largesse.[22] The parent firm of the split units can get scarce inputs; it can lower input prices thanks to the subsidies and concessional credit; it can also "evade tax by shifting profits to the lightly taxed small units through a kind of 'transfer' pricing, oversta-ting the price of the latter and hence high profits and thereby increasing its own tax-deductible input costs."[23]

Integration of modern small-scale into large-scale production

How much of the growth of the small-scale has been due to subcontracting rather than in competition with the large-

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22. On the infiltration of big capital (including MRTP and FERA companies) into small sector by capitalising on legal loopholes and adopting extra-legal means without impunity in order to systematically turn the priveleges and protection granted to small units to its advantage and aggrandizement, see the details in Goyal, Rao and Kumar, op.cit.; Also see Bhabhatosh Datta, "Small is Big: A Critique of the Industrial Policy Statement", Economic and Political Weekly, January 21, 1978; Nirmala Banerjee in Bagchi and Banerjee (ed.) op.cit.

23. Aditya Bhattacharjea, "Small, Large Industries Concept of Economic Federalism", Economic Times, October 30, 1980.

scale is a question[24] that cannot find a satisfactory answer in quantitative terms. The exact number of subcontractors/ancillaries and the dimensions of their supplies over time across industrial branches and across regions is not known and is not possible to estimate with precision.[25] Moreover, the available estimates are open to question as

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24. In both long-tailed and short-tailed industries, where the end-product is integral and produced in longer runs or dimensional and produced in small batches, the market structure could have two aspects at the same time, namely, inter-firm competition (as measured by the price elasticity of demand) and inter-firm interdependence or inter-firm purchase and/or subcontracting relations (as reflected in the interminacy of the firms' demand curves). The scope for the presence of many small firms in long and even short-tailed industries as subcontractors is not highlighted by Desai.

25. For example, consider the problem of estimation of the number of ancillaries. The latest official definition of an ancillary has the following components : the unit's upper size limit is more than a small unit's; it is at present pegged at Rs.45 lakhs worth plant and machinery. It should not be a subsidiary of, or owned or controlled by any other undertaking. The unit can produce parts, components, sub-assemblies, specialities like tooling, bearing, instruments, maintenance requirements or intermediates or auxiliary supplies or render services like sandblasting machinery, pressure cleaning, grinding, finishing materials, packing and packaging materials etc. It should supply or propose to supply at least 50 per cent of its production to one or more parent firms. The parent firm can be large, medium or small-sized. The ancillary should register itself with its respective State Directorate of Industries. See C.S. Raman, "Development of Ancillaries", Economic and Political Weekly, May 19-26, 1984 p.M-64; R.Poornam, op.cit.; Goyal, Rao and Kumar, op.cit. p.62; The point is that this definition is very restrictive; it excludes units supplying less than 50 per cent of their production, unregistered units, units controlled by large, medium and small firms, parent-cum-subcontractors, units making whole products on subcontract, subcontracting between larger firms or between a small parent and large subcontractor and so on. Also there are units such as those making commercial sulphuric acid considered as ancillaries by industrialists but their larger size does not correspond to the upper limit set by the official definition.

neither the definition nor the method of estimation is specified.[26] The magnitudes of estimates vary according to different ways of arriving at it, namely, value of sub-contract/ancillary supplies as per centage of total cost or total value of production or sales; or number of sub-contractable or subcontracted items as percentage of total number of parts and components at aggregated or disaggregated levels at different points of time. Tables 2.1, 2.2. and 2.3 show some estimates about potential and actual extent of subcontracting/ancillarisation in different industrial fields.

Notwithstanding the difficulties in arriving at precise estimates, there is ample evidence -- direct and indirect -- to show the increasing integration of smallscale with the large-scale sector. An analysis at the State level has shown that growth rates in modern small sector have a

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26. On the estimates of ancillaries and subcontractors, see J.D.Mehta, "Some Issues on the Development of Ancillary Industries in India", in BCCI, op.cit. p.91; Dhanraj Acharya, "Ancillaries and Subcontracting Industries in the Small Scale Sector, Problems and Prospects", United Nations Small Industry Bulletin, No.10 cited in FICCI, Workshop on Ancillarization, op.cit.p.24; Nasir Tyabji, "A First Approximation to an Evaluation of the NSIC Government Purchase Scheme", (mimeo), IIPA, New Delhi 1977 cited in Goyal, Rao and Kumar, op.cit.p.116; C.S. Raman, op.cit. p.M-64; R.Nagaraj, op.cit; D.K.Sawant, "Looking for Ancillary Development", Small Industry Bulletin for Asia and the Pacific, No.13, 1976 p.37; Annual Report on Ancillary Industries Development (by DC,SSI), op.cit.;

Table 2.1 : Extent of Subcontracting

Industry	Average value of subcontracted items as % of the cost of final product	% of the value of final product	% of the total value of production	Others
1. Industrial Machinery	10-15%			
2. Agricultural and Earthmoving machinery			15-20%	
3. Machine tools		10%		
4. Industrial, scientific and mechanical instruments			50%	
5. Locomotives, Rolling stock, ships and Aircraft		10%		
6. Bicycles		50-60%		
7. Boilers and steam-generating plants		5-10%		
8. Steam engines, turbines and internal combustion engines			20%	
9. Automobiles			50-60%	
10. Office and household equipment		5-50%		
11. Electrical Machinery, Equipment & Appliances		20-80%		
12. Telecommunications equipment				limited[1]
13. Industrial Instruments (Electrical)				limited[2]
14. Radios and Electronic equipment	50-60%[3]			
15. Airconditioners and Cold-storage equipment including refrigerators		15-20%		
16. Mineral Oil and Petrolieum Industries				limited[4]

1 & 2 : Because of few large manufacturing units;
3 : of the cost of a radio set
4 : There are only a few small subcontractors involved in the manufacture of equipment for marketing of refined petroleum products.

Source: Adapted from UNIDO, Subcontracting for Modernizing Economies, UN 1974 (Annex 1: Parts and components suitable for subcontracting according to the list drawn up by the Govt.of India in 16 industry groups in the 60s.)

Table 2.2. Current Levels of Ancillarization

	Industry	Range[a]
1.	Cycle	80%
2.	Mopeds and Scooters	50%
3.	Auto ancillaries	40%
4.	Consumer Electronics	30%
5.	Consumer Durable Goods	25%
6.	Machine Tools	25%
7.	Industrial Machinery	15%
8.	Electrical Machines, equipments and appliances	20%
9.	Chemical intermediates and drug intermediates	15%
10.	Dyestuff, points, packaging materials, industrial fasteners	100%[b]
11.	Instrumentation	10%[c]
12.	Basic Industries	1-2%

a. This is not specified; presumably, it refers to the value of bought-out items as % of total value of production.

b. Because, all these are ancillary and auxiliary supplies.

c. The whole industry is also considered an ancillary support industry.

Source: R.Poornam, 'Ancillary Industry Development", Lok Udyog March, 1980 p.26

Table 2.3. Potential Scope of Ancillarization

Industry	Weightage 1970 = 100	Ancillarization range
1. Transportation	12	60-90%
2. Communication	5	50-75%
3. Prime movers and power based industry	10	30-50%
4. Consumption and Consumer Durable Goods (household, office and commercial)	30	10-30%
5. Industrial machinery and machine tools	8	20-40%
6. Chemicals and pharmaceuticals Industry	15	15-30%
7. Basic Industries (metals, cement and petroleum)	10	5-10%
8. All other industries (wood, paper, fibres, glass, ceramics, leather and rubber)	10	2-10%

Source: R.Poornam, op.cit.p.28.

positive correlation with those of the large sector.[27] Sandesara's study has identified small units in 7 out of 17 industry groups which by the nature of their output would be expected to be "engaged in production or servicing complementary to large industry. They accounted for 58 per cent of the total units and 63 per cent of the total gross output of the modern small industry sector in 1972."[28]

A good number of items reserved for exclusive manufacture in the small-sector (from 1967 onwards) are complex, machine-made intermediate products/parts and components (eg. mechanical and metallurgical, chemical, electrical products) and final consumer goods for which the only buyers will be the large industries, via industrial

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27. Such correlation "shows that the growth of the small scale units in particular states or areas have been induced by the general tempo of industrialisation or linkage effects rather than by the development controls of the government intended to industrialize the 'lagging regions', semi-urban and rural areas." See A.Nag, "Growth of the Small-scale sector--an Assessment", Yojana, December 16, 1978; Majority of the small units are located in Delhi, Maharashtra, Punjab, Tamil Nadu, West Bengal, Gujarat, Bihar (in areas such as Bombay-Thana-Poona area, Calcutta-Howrah complex, Madras, Coimbatore, Chota-nagpur, Ludhiana etc) where the large-small, small-small ancillary connections have mushroomed. See Laghu Udyog Samachar, February and March 1979; FICCI, Report on Seminar on Prosperity through Balanced Industrial Development, Federation House, New Delhi February 5, 1970, p.7.

28. See J.C.Sandesara, "Small Industry Production in 1982-83; A Quick Estimate", Economic and Political Weekly, April 29, 1978. The 7 industry groups are chemicals, basic metals and alloy industries, metal products, machinery and parts, electrical machinery, apparatus etc., transport equipment and parts, repair and service.

and commercial subcontract arrangements[29]. In fact, there is some evidence that large companies have entered the reserved areas indirectly via such arrangements.[30] Further, as pointed out earlier, most of the 'split' units are ancillaries/subcontractors.

Furthermore, despite industry specifics and limited subcontracting in some industries like shipbuilding[31], a definitive impression follows from the literature that modern small-scale is well integrated into large-scale production and distribution via industrial and commercial subcontracting.[32]

29. See C.T.Kurien, "Small Industry in New Industrial Policy", Economic and Political Weekly, March 4,1978 p.460 and passim.; Bhabhatosh Datta, op.cit.; BCCI, op.cit.; George Rosen, "Industrial Technologies and Industrial Policies in India or When Small is Not Beautiful", in James Warner Bjorkman(ed.), The Changing Division of Labour in South Asia, The Riverdale Co.Publishers, USA 1986 p.62;

30. See Goyal, Rao and Kumar, op.cit. But, as they point out, these arrangements may decline due to partial or full de-reservation and due to allowing automatic growth or regularisation of excess capacity of large firms for products overlapping with the reserved items. This has been an un-researched realm.

31. The lack of significant ancillarisation in shipbuilding activity is attributed to low volume of production; unless Indian yards build at least 15 ocean-going vessels per annum, ancillaries and subcontractors cannot be loaded so as to operate economically. See "Towards a Modern, Viable Ship-building Industry", The Hindu (Business Review), October 23,1986.

32. In this connection, See Goyal, Rao and Kumar, op.cit; Ajay Kumar Rath, "Local and Global Operations of Multinational Corporations: Unilever in India", Social Scientist, October 1982; BCCI, op.cit.pp.111-16; T.Thomas, Managing a Business in India, Allied Publishers Pvt.Ltd., 1981 pp.30-33,178; A.N.Bose op.cit.pp.97-105; Annapurna Shaw, op.cit.p.51; SISI, "Fountain Pen Nib Industry in Sattur", Laghu Udyog Samachar, November 1979 pp.16-18; Lokesh Mishra, Trading Houses in India: An Evaluation, Working Paper 25, ICRIER, February 1985 pp.45,86 and passim; FEII, Seminar on Marketing Strategy for Small Engineering Industries, Federation of Engineering Industries of India, September 20, 1978, p.8-9; C.S.Raman, op.cit.p.M-65; Bharat Bhushan, op.cit.pp.M 81; V.V.Bhat, "Decision Making in the Public Sector: Case Study of Swaraj Tractor", Economic and Political Weekly, May 27,1978; Haseeb Drabu, Status of the Drug Industry in India: Report on a Seminar, Centre for Development Studies (mimeo, no date); Mukarram Bhagat, Aspects of Drug Industry in India, Centre for Education and Documentation 1981.

The important point is that this integration has occurred in Indian industries despite the "artificial divisions" between the large and small sectors and even because of them. In fact, the contention of the 1980 Industrial Policy Statement to remove the "artificial division" and foster integrated development of the large and small industry is nothing but the avowal of the already existing high level of integration via subcontracting/ancillarisation.[33]

It may be interesting to note that firms of equal size and different sizes have been interlinked by work-order-flows from abroad. Large firms and FERA companies, 100 per cent export-oriented units or 'green card' companies, export processing zones/free trade zones account for some growth of international subcontracting in India. The literature points out both 'unsatisfactory' growth as well as growing interest of foreign concerns in subcontracting to firms in India in the fields of electronics, textiles, leather, chemical (pharmaceuticals), hand tools and machine tools, machinery, transport equipment (especially auto

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33. See Aditya Bhattacharjea, op.cit.

parts, original and spare), other light engineering, electrical etc.[34]

There also seems to be a boom in the activity of 'spurious' spares ancillaries (who put inferior parts inside original packs and make high profits on them). These ancillaries thrive on the phased process of obsolescence in the original equipment manufacturing units due to change of models or design or part number.[35]

Reasons for growth of subcontracting in modern industries

The particular factor or congeries of factors that

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34. To illustrate, FERA companies such as Lucas TVS, MICO, Ashok Leyland, International Computers India Ltd.,KSB Pumps, Philips, Murphy etc., export significantly on the basis of international subcontracts; Lucas TVS receives orders not only from abroad but from foreign related and other large firms in India. Apart from in-house manufacture, it resubcontracts to small,medium and large firms. Similarly, International Computers subcontracts to Bharat Electronics Ltd. (for peripherals and diodes to be incorporated in its computer system). See APO, International Subcontracting....,pp 185-205; Also See, "What ails India's FreeTrade Zones ?", Business India, August 6-19,1979; "A New Boost to Free Trade Zones", Business World, February 13-26,1984 ; "Import concession to Export-oriented Units", The Hindu, May 30,1984 p.6; "TheConfusion about 100% Export Units", Business India, July 15-18, 1982; Ashok V.Desai, New Forms of International Investment in India, NCAER, New Delhi 1983; K.K.Subramanian and P.M.Pillai, Multinationals and Indian Export, Sardar Patel Institute of Economic and Social Research, Ahmedabad 1978.

35. See P.Gopalakrishnan, "Spares Control for Cost Reduction", The Hindu, July 6, 1983,p.21. These ancillaries also thrive because the large sector is still heavily dependent on imported equipment and consequently on imported spares and because OEMs lack in-house facilities to produce them and their subcontractors(supplying original parts) are chary of supplying them directly to the replacement market.

govern the impulse to subcontract may vary between firms. However, some general factors that may have induced the emergence of subcontracting in India can be identified.

In the '50s and '60s, the verticalised large firms were confronted with the problems of diseconomies of scale, capital-equipment imbalances, and underutilisation of capacities. Parallel to this was the disproportionate development of modern small units and the consequent problem of excess capacity in the small sector too. In this context, subcontracting and ancillarisation took shape as a possible solution for fostering capacity use by both large and small firms. We must also recognise that the new pattern of intra-industrial relationship and interdependence was something integral to the growing trend of product and process specialisation in the process of industrialisation itself. This interlinkage was in a way largely shaped by the government policies of import substitution. Even in the '70s, the decision of many firms to subcontract was taken to benefit from economies of scale and the use of specialised machinery and services of the subcontractors.[36]

36. See C.S.Raman, op.cit. p.M-65; Annual Report on Ancillary Industries Development, op.cit.; K.K.Subramanian, op.cit; UNIDO, op.cit.; Susumu Watanabe, "Reflections on...." op.cit.p.413; "Ancillary Development and Subcontracting in India", Laghu Udyog Samachar, November 1979 pp.27-29; Bharat Bhushan, op.cit. p.76

Large firms, faced with a spurt in demand but operating at full capacity or constrained to expand further due to government regulations, reservation policy or otherwise could overcome the problems by offloading components, subassemblies etc., to small units. In early '70s, large firms, especially in engineering, were severely restricted by MRTP licencing laws. Hence there was the recourse to subcontracting.[37]

In the '70s production costs increased mainly due to two factors. There was rise in cost of capital in the organised sector. The number of excisable products, especially engineering items shot up in the large sector. As against this, some small units were exempted and others were subject to low rates. Hence the tendency of subcontracting to small units gained currency.[38]

Subcontracting could have emerged as a strategy to reduce the risk of future fluctuations in the light of the 1966-69 recession. Further, the growth of inter- firm competition consequent upon the recession and labour problem go a long way to explain the diffusion of subcontracting

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37. See Bharat Bhushan, op.cit.p.76

38. ibid. p.76

practice across the industrial spectrum.[39]

The market is said to have changed from a sellers into buyers market in the aftermath of the mid-60s crisis.[40] According to Desai's analysis, the 1966-69 slump "led to the shaking out of inefficient firms. Success went to the firms which adapted themselves better to the problems of increased competition, cost control and quality control; and technological competence was a major device in this adaptation." The recession hit hard engineering, electrical and vehicles industries.[41] By 1978-79, in industries such as boilers, metallurgical machinery, mining machinery, commercial vehicles and cars, competiton increased in terms of number of firms and technological upgradation. In tractor industry, market became competitive in the '70s; product differentiation became less and price competition and competition in dealer commissions and the need for production

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39. See in this connection, FICCI, Industrial Recession: Causes and Cures, December 1967 (mimeo); FICCI, Report on Seminar on Prosperity... op.cit.p.72. The latter source said: "About a decade ago no largescale unit came forward to set up ancillary units because of sheltered market and scarcity of raw materials. However, after the recession, the largescale units started feeling that it was economical for them to develop ancillaries and get the components and other parts produced by the smaller units."

40. ibid.p.69

41. We may note that the recession led to sickness and collapse of many of the then existing ancillaries. But the recession also created conditions for a new way of ancillarization.

cost-down increased.[42] The late 60s also marked the rise of diversification strategies of large firms. Diversification created demand for new technology from foreign suppliers and hence the growing foreign collaboration agreements (joint ventures and technical licence) over the '70s.[43]

Alongside these changes, the '70s were also marked by (barring the oppressive 'emergency' interregnum) labour unrest and mounting industrial disputes (as reflected in strikes, layoffs and lockouts, with the latter two accounting for most of the man-days lost) giving rise to a crisis in managerial control over labour process. Subcontracting (of different types and forms) became a potent weapon in the hands of the capitalists to circumvent labour militancy and increase profitability by taking advantage of lower wages and overheads in the small sector.[44]

42. See Ashok V.Desai, Market Structure....,op.cit.pp.35,62, 95. See

43. See Ashok V.Desai, New forms of International....,op.cit p.19. According to him, the main problems of the capitalists during the 70s as pointed out by themselves in their respective annual reports were power shortage, material shortage and labor problems.

44. On these lines, see the evidence in Bharat Bhushan, *Technology and Work Organisation in the Indian Electrical Engineering Industry*, Ph.D. thesis submitted to the University of London, Department of Social and Economic Studies, Imperial College, London September 1982 pp.160-62, 316,327 and *passim*; Jairus Banaji, op.cit.; André Gunder Frank, "Unequal Accumulation: Intermediate, Semi-peripheral and Sub-imperialist Economies", *Review*, No.3, Winter 1979 pp.316-22. That in the 70s and 80s the number of labour-management agreements incorporating clauses related to ancilarisation has been on the rise is pointed out in Bharat Bhushan, *Ancillarisation*.... op.cit.p.85

Thus, in the milieu of the specific strategies of capital--rationalisation, diversification and centralisation[45]-- and of progressive liberalisation of licensing system and controls on all other fronts since around the mid-60s , that must have intensified inter-firm competition, there emerged and grew subctontracting relations in modern industries in India.

In the wake of increasing importance of subcontracting, a number of hypotheses have been advanced on its rationale. There is a postulate that as small units get concessional finance, large firms subcontract and extract longer credit from the small firms (by delaying payments).[46] This postulate cannot stand up to the growing reality of non-availability of timely financial assistance from banks etc., to small units. Also large firms generally delay payments irrespective of the financial situation of the ancillaries in the process of husbanding their own cash position.

Another postulate is that in the context of marketing problem encountered by small firms, subcontracting could be a means of growth for them, albeit with low profit margins.[47]

45. For the elaboration, sketchily though, of the actual working out of these strategies, see Jairus Banaji, op.cit.
46. See R.Nagaraj, op.cit.p.16
47. ibid.p.19.

According to a study, modern small units in subcontract position showed higher earnings and rapid growth than modern small units producing final goods with low-productivity techniques and in competition with large sector.[48] However, when the parent firms find themselves in a downturn, the first victims would be the subcontractors/ancillaries as pointed out in the previous chapter.[49] Many small units, unable to directly penetrate the oligopolised markets, are perforce subject to exploitation by large firms via commercial subcontracting. It is unlikely that this exploitation permits high profitability and growth of small firms in general.[50]

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48. This is according to a paper presented at Centre for the Study of Social Sciences, Calcutta, cited in Aditya Bhattachargea, op.cit.

49. For example, many engineering ancillaries thrived due to the brief boom during the Third Plan on the basis of railway expansion programme. But when the mid-60s crisis set in, the orders were withdrawn and the ancillary boom collapsed. These ancillaries also lost to competitors in Bombay or Faridabad. Even in the boom period, the self-employed owners of ancillaries could not earn for themselves at least a wage-equivalent to that he paid to his workers. See A.N.Bose, op.cit. cited in Nirmala Banerjee in Bagchi and Banerjee (ed.) op.cit.p.284

50. A study by NSIC found that despite the unequal relationship between the parent firms and ancillaries, affecting the profit margins of the latter, there are ancillary enterpreneurs who could manage to make high profits and "relax in air-conditioned comfort" on the basis of super-exploitation of cheap labour. See National Small Industries Corporation, Ancillary Relatinship-- A Case Study of a Public Sector Unit and its Ancillaries (mimeo, no date), cited in R.Nagaraj, op.cit.p.45

Yet, another postulate is that the decline in factory concentration (by size of employment) could imply the growth of subcontracting.[51] But this decline might also be due to labour displacing mechanisation or splitting up or labour-only subcontracting or employment of casual labour at the cost of the permanent workers.

Subcontracting may be due to the interest shown by some sections of the big business in actively supporting the development of a diversified ancillary/subcontracting industry in order to break the monopoly power of limited sources of supply.[52]

Lastly, it has been argued that subcontracting is one of the ongoing reorganisational changes under the over-hanging cloud of relative stagnation that would resurrect the growth rate of the industrial economy.[53] But as has been pointed out already, though it stands to reason that subcontracting reduces costs, increases profitability and thereby growth of a firm, in quantitative terms it is difficult or may not be possible to find out the extent of

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51. See R.Nagaraj, op.cit.p.26-31 for the data showing decline in factory size.
52. H.P.Nanda, "Factors Affecting the Growth of Ancillaries", Lok Udyog March 1980. The author's views are on behalf of the Associated Chambers of Commerce and Industry, New Delhi.
53. See Banaji, op.cit.; R.Nagaraj, On Crisis and Accumulation: An Attempt Towards Understanding the Development Tendencies of Capital in India Since the mid-60s, (unpublished) 1980; Sudipto Mundle, Some Speculations on Growth, Disparities and Capital Reorganisation in the Indian Economy, Working Paper 124, Centre for Development Studies.

ancillarisation/subcontracting in individual industries (with subcontracting possibilities). Also, there is the problem of knowing how representative these industries are in terms of their changing relative weights in the manufacturing sector as a whole so as to decisively speak about subcontracting as a growth facilitating and/or inducing structural change. Furthermore, there is no reason why the growth of subcontracting itself could not be determined by steady, high growth rate of the economy, say at 8-10 per cent, which would create competitive conditions in industrial investment and capacity utilisation to service expanding markets.[54] The cause-effect argumentation and proof are not clear.

Having considered growth and rationale of subcontracting in Indian manufacturing in general, we shall move on to industry-specific analysis.

Section 3: Subcontracting in Indian Electronics

The logical basis for subcontracting can be further explored with the case of electronics, which is a modular industry where the scope for subcontracting is quite high.

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54. See R.Poornam, op.cit.

Growth and structural changes

The origins of electronics industry in India can be traced to the 1950s when domestic production of radio sets was initiated. The industry, structured primarily to meet domestic consumption, can be said to have taken firm root in the 1960s. The growth of the industry--both in terms of volume and value (at current prices) -- had been impressive through the seventies (See Table 2.4). During the 1971-81 decade, the value of electronics production registered an overall annual compound growth rate of 17.3 per cent with simultaneous growth of all sectors--professional electronics sector at 17.8 per cent, consumer electronics sector at 16.8 per cent and components sector at 15.8 per cent -- and subsectors [55] (See Table 2.5).

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55. The consumer electronics sector comprises various items such as radio receivers, television sets (monochrome and colour), tape recorders (including combination sets), record players, amplifiers, public address systems, calculators etc. The professional electronics sector has four subsectors: (1) control, instrumentation and industrial electronics (CIIE), (2) communication and broadcasting equipment, (3) computers, and (4) aerospace and defence equipment. The components sector consists of (i) electron tubes (various types), (ii) semiconductor devices or active components (like transistors, diodes, integrated circuits etc.), (iii) passive components (like resistors, and capacitors of fixed and variable types etc), (iv) other passive components (TV deflection components, loudspeakers, microphones, crystals, magnetic heads, cartridges, stylus, magnetic tapes, soft and hard ferrites, permanent magnets etc) and (v) electromechanical components (such as connectors, relays, switches, printed circuit boards, tape decks, metal rectifiers, DC micromotors etc.) On the growth rates of the three sectors, see R.C.Chopra and G.Rai, "Potential for Subcontracting and Ancillary Development for Consumer Electronics Industry in India" Working Paper I-2, National Workshop on Subcontracting in Electronics, February 11-12, 1983, Bangalore.

Table 2.4. Trends in value of production of Electronics from 1971 to 1982

Year	Value of production (Rs.in crores)	% increase or decrease over base year	% increase or decrease over previous year
1971	173	-	-
1973	205	18.5	18.5
1975	365	110.9	78.1
1977	500	189.0	37.0
1979	647	273.9	29.4
1981	865	394.8	32.3
1982	1208	596.5	40.8

Source: Department of Electronics, Government of India, cited in S.H.Naqvi & B.A.Iqbal, "Indian Electronics : An Integrated Policy for Planned Growth and Development", Purchase (Products, Equipment & Processes) Vol.8, No.11, November, 1983 p.61.

Table 2.5. Profile of Electronics Production 1971 - 81

(Rs. in crores)

Sector	1971	1976	1981	Compound growth(%) (1971-1981)
1. Consumer Electronics	52	101	246	16.8
2. Communication Equipment	40	112	154	14.3
3. Aerospace & Defence equipment	28	50	69	9.5
4. Computers, control and Industrial Electronics	13	64	188.5	31.0
5. Components	40	80	173	15.8
6. Free Trade Zones	-	3	25.5	-

Source: R.C.Chopra & G.Rai, op.cit (Table 1)

The seventies are also said to have seen major structural changes. The industry diversified from predominantly consumer-oriented sector towards professional electronics. Within the sectors there was diversification in product range and application areas.[56] However, as regards structural shifts in terms of sectoral distribution of electronics production value (see Table 2.6), the shift towards professional electronics during 1971-81 is not marked; the relative share of professional electronics

Table 2.6 Structural Shifts in Electronics Sectoral Distribution of Value of production(Rs.in crores)

Sector / Year	1971	1981	1985	% point change (1971-81)	% point change (1981-85)
Consumer Electronics	52 (30.05)	246 (28.73)	1030 (28.73)	-1.32	+10
Professional Electronics	81 (46.82%)	411.5 (48.08)	1135 (42.66)	+1.26	-5.42
Components	40 (23.13)	173 (20.22)	410.0 (15.42)	-2.91	-4.80
SEEPZ[a]	-	25.5 (2.97)	85 (3.19)	+2.97	+0.22
Grand Total	173 (100.0)	856 (100.0)	2660.0 (100.0)		

a. Santacruz Electronics Export Processing Zone

Source: 1) For the years 1971and 81, R.C.Chopra & G.Rai, op.cit.
2) For the year 1985, Electronics, June 1986.p.71

Note: Figures in parantheses indicate vertical percentages.

56. ibid.

increased by only 1.26 per cent points. During the 1981-85 period, professional electronics declined by 5.42 per centage points whereas consumer electronics grew by 10 per cent points. The latter's growth can be largely attributed to the implementation of the Special TV Expansion Plan.

The seventies also saw increase in the production based on indigenous knowhow, promotion of State Electronics Corporations (in about 10 States), enhanced capability for undertaking systems engineering and turnkey project excutions for electronic systems, in-house R & D capability in professional electronics, geographical spread and substantial growth of small-scale sector.

However, when put on the international scale, the real progress in the development of electronics in India appears less promising in itself and as compared to its development in other developing countries such as South Korea; real output is much less and the growth "sluggish and warped" due to relatively high cost-price structure. There seems to be no real breakthrough in terms of the growth of the domestic value added either; a major part of the value of output seems to be due to imported items produced elsewhere in the world. There seems to be more proliferation of units assembling imported parts, CKD/SKD kits than of manufacturing units proper, especially over the '80s. This practice is particularly evident in consumer-grade equipment sector, computers etc.[57] The indigenous technology base is low and concentrated in entertainment electronics (eg. radio, black and white TV). In general, R & D lags of the entire spectrum of the industry is of the order of 8-10 or 10-15 years. Of late there has been rapid diffusion of what is called "screw driver technology", especially in consumer electronics, computers etc.[58]

We shall not digress into a detailed profile of the

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57. Imports have been legal as well as illegal. For example, there has been heavy smuggling of color TV sets, VCRs, quartz modules etc., in SKD form for local assembly. Legal imports have become easier with the increase in personal baggage allowance and other import liberalisation measures. Even the indigenous production of less sophisticated parts for consumer electronics are largely produced with imported capital goods, raw materials etc.

58. On these lines, see Report of the Study Team on Consumer Electronics Industry (Background report submitted for consideration to the 7th Plan Working Group on electronics industry) in Electronics, Information and Planning, Vol.11, No.12, September 1984; AIEI, Background Paper on Indian Electronics Industry, Workshop on Electronics, February 1979, p.8, 17, 47 and passim; Prabhu Deodhar and Prakash Vaidya, "Electronics Industry in India", Electronics Today Vol.11, No.5, May 1978 p.36 and passim; "Proceedings of the Two-day Seminar on the Role of Electronics Development Corporation, Discussion", Electronics Today, May 1978 p.43 and passim; "Electronics Gathering Momentum" in The Economic Scene, May 1984; "Electronics : Has India Missed the Bus ? in Business India, October 1-14, 1979 p.40.

structure and growth of the industry[59], but we may note briefly the relative importance of the small-sector.[60]

Size and Cost Structure

The industry as a whole is long-tailed. It is estimated that the number of units in the organised and small sectors was 120 and 1000 in 1980[61] and 150 and 1800 in 1983[62] respectively. Estimates of the number of units in the small sector seem to be wayward.[63] As for

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59. For a comprehensive profile, see "Profile of Electronics Industry in India", Electronics Today, January 1981 and July 1983; "Report of the Review Committee on Electronics" Parts 1 & 2, Electronics, Information and Planning, Vol.17, No.6 &7, March and April, 1980; Bhalraj Bhanot, "Profile of Electronics Industry in India", Electronics, Information and Planning, vol.4, No.3, December 1976; "Report of the Planning Commission Working Group on Electronics Industry" (for Plan 1978-83), Electronics, Information and Planning, Vol.6, No.1.1978.

60. In this connection, see R.C.Tripathy, "Status and Scope of Small Scale Sector in Electronics", Electronics, Information and Planning, Vol.7, No.11, August 1980; R.C.Chopra and S.L.Sarnot, "Small scale sector in Electronics: Appraisal Prospects and Policies", Electronics, Information and Planning, November 1980; Present Status of Electronics Industry in Small Scale Sector, Working Paper I-3, National Workshop on Subcontracting in Electronics, Bangalore 1983.

61. See "Report of the Review Committee...", op.cit. (Part I)

62. See "Profile of Electronics Industry...", Electronics Today, July 1983 pp. 354-55.

63. For, in consumer electronics alone, the number of small units is said to be 2500 in 1983 and 3000 in 1984 apart from 20 organised units. See R.C.Chopra, "Small Sector in Electronics in India", Electronics Conference and Exhibition (EXCEL), Ahmedabad 1984 p.109; R.C.Chopra and G.Rai, op.cit. p.2

value contribution, the share of small sector in the total value of electronics production increased from 19 per cent in 1971 to 28 per cent in 1979 and to around 30 per cent by early 1983.[64]

As regards the areas ofproduction, the organised sector is concentrated in defence and communication equipment, power electronic equipment, instrumentation and components due to scale and large capital investment considerations. The small sector is concentrated in assembly-oriented consumer-grade equipment, certain low-cost types of test and measuring equipment (like multi-metres, signal generators, power supplies, timers etc), process control instruments, medical and analytical equipments within the CIIE subsector, and consumer grade components (such as tape deck mechanism, TV tuners, TV deflection components, coils, printed circuit boards, transformers etc.) and a few professional components, such as computer peripherals.

The share of small sector in the total production value of consumer electronics during the early '80s was 68 per cent.[65] And as Table 2.7 shows, the small sector has also a

64. R.C.Chopra and G.Rai, op.cit.p.1. Elsewhere Chopra points out that this growth has been largely due to the growth of few bigger small units-about 100 units contributing to 40 per cent of the production. See R.C.Chopra, op.cit. (EXCEL-84) p.109.

65. See "Electronics Industry in 1982-83 Supplement", Electronics for You, June 1983 p.50; "Annual Report (1982-83) of the Department of Electronics", Electronics Today June 1983, p.46.

Table 2.7

Share of Small Scale Sector in Production value of Major Consumer Electronics Items

Item	Unit	Production		Share of Small Sector (%)
		Quanti-ty	Value(in Rs.crores)	
Radio receivers	million Nos.	4.42	(98)	57
T.V. sets	1000 Nos.	270	(59)	77
Record players	1000 Nos.	131	(70)	27
Amplifiers & Public Address Systems	1000 Nos.	148	(28)	94
Tape Recorders	1000 Nos.	151	(12)	63
Total 1978			267	

Source: Market & Market Shares for 200 Industrial Products/ Product Groups , Economic Intelligence Service, Centre for Monitoring Indian Economy, August 1980; Also see for a similar picture, "Report of the Review Committee....", op.cit (Part 2).

dominant share in the production value of major consumer-grade products except of record players. The CIIE subsector (which accounted for about 15 per cent of total Electronics production in 1980) is long-tailed but the organised sector contributes 75 per cent of the output value of the subsector.[66] The areas of mass-communication, telecommunication, aerospace and defence and computers are all short-tailed and the bigger organised units accounted for 40 per cent of total electronics production value in 1980.[67] The components sector (which contributed to about 25 per cent of total electronics production in 1980) is long-tailed but about 70 per cent of its output value is from the organised bigger units involved in the capital intensive, R & D intensive manufacture of process-oriented components. The small sector in the components field is dominant in consumer-grade components and a few components for test and measuring instruments; its share in the sector's output value increased from 23 per cent in 1971 to 28 per cent in 1981.[68]

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66. See AIEI, Background Paper...., op.cit.p.11; "Profile of Electronics....", Electronics Today, January 1981,p.52.

67."Report of the Review Committee...." (Part 1),op.cit.p.354-55.

68. See"Profile of Electronics...", Electronics Today, January, 1981 p.54; G.Rai, "Analysis of Technical and Financial Factors inhibiting the Growth of Small scale sector in Electronics", Electronics, Information and Planning, Vol.9, No.2, November 1981, p.80.

Having considered the size-structure, let us examine the cost-structure of the industry[69]. Contrary to the common belief, the unlimited supplies of cheap labour in the country did not lead to low cost. The following factors could account for the lack of real dynamism of the industry.

The industry is afflicted with diseconomies of scale, that is, cost-ineffectivity of current levels of production. The sub-optimal scales of end-equipment and components manufacture[70] have led to diseconomies such as high costs, low R & D per unit of output, unprofitability of production and of design engineering and supporting industries, lack of standardization and quality control. The consequent uncompetitive prices have reduced the market-size, which in turn has led to low levels of production and the ensuing diseconomies--a neat vicious circle. The low growth and incompatibility of the components sector--the building blocks of the industry -- with

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69. See AIEI, Background Paper....op.cit.; Michel Neri, "Electronics; Will India miss the bus again?", Business World, February 13-26, 1984.

70. For example, the annual production of leading units in the country is less than the monthly output of leading units in international market.

the changing demand pattern[71] of the user industries has constrained the growth of the other sectors.[72]

The suboptimality of production has been due to the large-scale issuing of licenses to small sector in components and consumer electronics sectors and in CIIE sub-sector irrespective of techno-economic viability calculations on the general grounds that in these fields the turn-over to investment ratio is very high and that the direct and indirect employment generation per unit of capital investment is much higher. Table 2.8 shows some estimates of scale and capital investment requirements for efficient manufacture of certain important components. According to

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71. The incompatibility is in terms of the non-availability of modern-range of components. The traditional components are disadvantageous in many ways: (a) their dimensions are too large compared to the international efforts at miniaturisation, (b) their physical configuration is not suitable for mass assembly, (c) width, length of lead wires are not standardized and solderability is poor so that they cannot be used in new assembly processes such as auto-insertion and flow-order, (d) they have reduced the reliability levels in complex and expensive equipments. See "Report of the Study Team on Consumer Electronics....", Electronics,Information and Planning, op.cit.

72. The lag in components manufacture has been increasing the percentage of imports (especially of professional-grade components) at higher import duties on higher international prices. It is said that the foreign suppliers charge a premium over and above the cost price so as to compensate for their proportional fall in end-equipment production. See AIEI, Background Paper ....op.cit.(Annexure III & IV)

Table 2.8. Scale and Capital Requirements for efficient manufacture

Components	Scale (in million Nos.)	Capital cost (in Rs. million)
Transistors & diodes	10	8
Carbon and metal film resistors	100	2
Potentiometers	2	1.2
Plastic film capacitors	5	1
Electrolytic capacitors	5	11
Ceramic Capacitors	40	10
Variable capacitors	2	1.2
Magnetic heads	0.5	4
Ferrites	60tons	2
T.V.deflection components	50,000 sets	0.5

Source: AIEI, Background Paper....,op.cit.p.22

AIEI, in the seventies, "with the exception of potentiometers, plastic film capacitors, variable capacitors and TV deflection components, none of the items can be economically produced within the existing small scale definition of Rs.10 lakhs. Even these require continuous in-house R & D facilities, which cannot be provided for when the entire investment goes into capital outlays."[73] The small-scale has also been

73. See AIE, Background Paper....,op.cit.p.22

given a boost by way of a reserved list of items[74] and other concessions and assistance.

The small-scale bias has compounded the problem of diseconomies by resulting in fragmentation/duplication of capacity. It has been observed that small-scale units have not been expanding or expanding by splitting up for the same reasons we had mentioned before.[75]

The high cost-price has also been substantially due to the cascading effects of multiple taxation (excise duty on ex-factory value plus central sales tax plus octroi plus sales tax etc.). Further, the low depreciation allowance based on historical (original) costs instead of replacement costs granted by the government against the relatively high rates of obsolescence in respect of products and capital goods has been said to be a disincentive for low-cost-techno-

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74. Twenty four to 25 items have been reserved for the small sector out of which 10 belong to consumer electronics. Also the State Directorate of Industries has been given the authority to issue direct licences without referring to the Central Govt.for 48 items. See ELCINA, Indian Electronics Directory 1982-83, pp.41-46; According to another source, there are 82 end-product items whose manufacture can be licensed at the state level. See "Report of the Study Team on Consumer Electronics....", Electronics, Information and Planning, op.cit.

75. See "Report of the Study Team on Consumer Electronics...", op.cit.p.813.

logical upgradation.[76]

In sum, all these may have led to the vicious circle of high prices leading to small market leading to sub-optimal scales leading to higher prices leading to poor sales-demand on the domestic and international markets.

However, the year 1980 seems to mark a major turning point in the trajectory of the industry. A series of liberal policies have been coming forth since then towards low-cost rationalisation and re-organisation of the industry -- delicensing of consumer electronics sector, lower duty rates, easier imports, easier terms for foreign collaboration, allowing MRTP/FERA companies to enter the components field and set up large-scale viable units etc.[77]

Extent of subcontracting in electronics : Some Evidence

A notable change (much before the onset of the above policies meant for breaking the vicious circle) has been with respect to fostering subcontracting relations between larger organised units and small units for cost-price cutbacks.

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76. See AIEI, Background Paper..., op.cit. (Annexure V and VI). The annual depreciation expense to set against revenue is calculated by straight line method by deducting the residual (scrap) value of an asset from original cost and then dividing the balance by the number of years of the estimated life of the asset.

77. For the note on the policy of the Department of Electronics (DOE) regarding components field, see "Parliament News", Electronics, Information and Planning, July 1983, Appendix II, p.650.

Prior to this change, the small units were expected to exist as stand alone entities (undertaking design, product development, manufacture, testing and taking up marketing and after-sales servicing on their own etc) and compete with the bigger units. But most of them lack organisational strength or adequate financial support for market development and market penetration (via aggressive sales campaign and after-sales-servicing) which are indispensable for survival and expansion, particularly in consumer electronics field. The consortia approach[78] to these problems having failed, it has now been realized that the solution lies in commercial subcontracting arrangements between big and small units.

Further, in electronics industry too, most of the large projects in the organised sector were initially built with in-house capabilities for everything. But this resulted in overinvestment and underutilisation of captive capacities. Again here too the solution of industrial subcontracting has been emphasized, with organised units specializing in research, design, development, final assembling

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78. See Ram K.Vepa, "Aid in Marketing to Small scale Electronics Production", Small Industry Bulletin for Asia and the Pacific, No.13, 1976; Ram K.Vepa, "Consortium of Small Units in Electronics", Small Industry Bulletin for Asia and the Far East, No.11, 1973 which points out that by that time itself there were cases of some large units making offers to small entrepreneurs to be subcontractors or licensees because they were denied licenses.

and testing of the end-product and small units specialising in the production of less sophisticated components, sub-assemblies/modules, toolings, jobworks and servicing operations.

Increasingly corporate decisions seem to have thus favoured subcontracting for in-house production, particularly where items of non-critical technology involving batch production are involved.7 Some qualitative evidence indicates that "subcontracting to small scale industry units is a relatively new feature in the area of electronics in India;[80] that "domestic subcontracting has been well developed only in India and Japan" and that in India "no specific incentive has been offered for subcontracting except that generally subcontractors are small scale entrepreneurs and there are certain special facilities available to them"[81] ; that "ancillarisation and subcontracting has reached a very high level, especially in the manufacture of more common products like consumer electronic items. There exist also numerous small and medium industries engaged in the design and assembly of instruments. These units also act as subcontractors for making instrument units for larger organisations who do system engineering and turnkey jobs in building

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79. See Subcontracting in Electronics--Opportunities and Challenges, Working Paper V-4, p.2, National Workshop on Subcontracting in Electronics, 1983.

80. See Working Paper II-1, National Workshop on Subcontracting in Electronics, 1983.

81. See "Report of the Seminar on Subcontracting and Complementation.....in..... ESCAP.....", Electronics, Information and Planning, op.cit , pp.383,402.

stations etc."[82]; and that "the most significant subcontracting activity in India is in the area of electromechanical components and subassemblies".[83] International subcontracting too has been on the rise to some extent.[84]

In the year 1982, about 20-25 per cent of value of supplies($234 million) from 10,000 ancillaries established due to the mediation of various subcontracting exchanges in the country was said to be in the electronics field. This estimate applied to subcontracting by public sector units only. Subcontracting by private sector units was said to be three times the public sector figure.[85]

The age-old putting out system has become a new strategy of the Electronics Trade and Technology Organisation (ETTDC) for developing internationally cost-effective, subcontract-exports. It puts out well-tested CKD/SKD kits

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82. Summary paper presented by Electronic Components Association, India, ibid. p.399. This association represents 95 per cent of the components industry and "many of its members are making use of subcontracting to get subcomponents manufactured through small units, while some undertake subcontracting on behalf of industrial units in India and abroad."

83. ibid.p.399.

84. The Indian govt. provides the same incentives and facilities as are available in the free trade zones to local firms undertaking subcontracting on behalf of foreign firms, for re-export after processing. See Country Papers : India, ibid. p.389.

85. See Summary paper presented by the Office of the Development Commissioner (Small Scale Industries), India. ibid. p.399. How these estimates are arrived at is not specified, though.

(for the assembly of, for instance, 12-inch monochrome TV sets, mini-megaphones, fluorescent lanterns, car stereos etc.) to small units in rural and backward regions. ETTDC foresees a large-scale development of such exports on the basis of putting out of assembly work to clusters of small units in the villages, nation-wide. These clusters could also serve as subcontractors to large industries.[86]

There exist an extraordinarily diversified legion of Central and State public sector undertakings in Indian electronics which have taken up ancillarisation programmes. Apart from many subcontracting exchanges, there are around 10 electronic industrial estates, 4 Electronics Regional Test Laboratories (ERTCs), 18 Electronics Testing and Development Centres (ETDCs) to provide infrastructural support for the ancillarisation programmes of the various public units. These state units were also expected to provide the lead in regard to commercial subcontracting (i.e. marketing the products of small units). But there seems to be a big gap between rhetoric and reality; ancillary supplies account for an insignificant and in many cases declining percentage of their

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86. ibid.p.399; Also see Development of small scale Electronic Entrepreneurs in Rural/Backward Areas, Working Paper V-1, p.2-3, National Workshop on Subcontracting in Electronics, 1983.

turnovers.[87]

From the small units' side, the empirical reality of subcontracting in the '70s was observed as follows: "Small scale units which start as independent entities after a while end up as dependent on one or two large customers for job work or to make ends meet...The typical small-scale entrepreneur is generally a qualified engineer who either has spent some time in a large organisation specifically to pick up knowhow in order to start his own company or else he is some one who has been with a large firm for a number of years and then suddenly realises that his company is buying substantial quantities of components and subassemblies from small scale industrial units; so he quits and sets up his own unit, hoping to become a vendor to his former employers."[88]

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87. See Dhanraj Acharya, Small Sector in Electronics in India: Is 'small' no longer 'beautiful' ? Working paper V-5, p.2, 4-6. National Workshop on Subcontracting in Electronics; Also see Status and Scope for Subcontracting in Electronics Industry and Possible Monitoring Mechanisms (Annexure IV p.11), National Workshop on Subcontracting ...; "Report of the Seminar....ESCAP....", Electronics, Information and Planning, op.cit.p.400.

88. See "Electronics: Has India Missed the Bus?", Business India, October 1-14, 1979, p.54. The same source points out the development of a recent phenomenon of a new class of entrepreneurs returning from abroad to specifically set up their industries. It also says that "the profile of the typical small scale electronics unit is roughly the same whether it is located in Bombay,Delhi, Hyderabad, Pune or Bangalore--an enterprise run by one qualified engineer employing fewer than 10 semi-skilled workers (above 10, the Factory Act applies) supervised by one diploma holder and occupying between 40 and 80 meters of floor area with a minimum of equipment and facilities", in bungalows and garages (as has been observed in Pune, Bangalore) and in the industrial estates in suburban areas (as in Bombay).

Subcontracting in Selected Sectors of Indian Electronics

Consider the consumer electronics sector.[89] The bill of materials (i.e. of parts and components etc) account for 60 to 75 per cent of ex-factory value of the end-products. The degree of integration of the firms (i.e. the ratio of parts made within the organisation and those bought-out from third parties) is already very low or nil in this sector. The bought-out items consist of sophisticated standard components (passive as well as active, for example) which are usually bought from medium and large scale firms specialising in their manufacture and a large number of other components and items which are procured from small units on subcontract. In this sector, larger firms can even subcontract out final assembly operations and concentrate only on quality control, testing and marketing.

Subcontracting of final assembly seems to be widespread in the subsectors such as radio receivers, television sets, calculators, voltage stabilisers etc. In the radio receiver industry, the phenomenal expansion of production of low-cost transistorized sets in the small sector could be based on two factors: the large, organised units have taken up production of these sets reserved for the small sector by setting up a string of small units and even

89. See R.C.Chopra and G.Rai, op.cit.; R.C.Chopra and S.L. Sarnot, op.cit. p.76; U.V.Warlu, "Role of SSI in Consumer Electronics" in EXCEL-84.

carried on production far in excess of capacity[90] and/or they have established commercial subcontracting linkages with 'independent' small units.

Take the case of Philips.[91] It has been the corporate policy of this multi-plant, multinational in India to eliminate vertical integration and spread manufacturing activity over a variety of items pertaining to various fields in a large organisation saddled with the burden of high overheads and lower flexibility. The Company makes certain critical items in-house, purchases standard items from other companies and subcontracts several specialised/non-critical items to small and medium units (including cottage industries, welfare institutions like Blind Men's Association, Charitable organisations etc.). It claims to have provided the subcontractors with institutional (tooling facilities, training), financial, technical and other general 'guidance and assistance'. It has also been the policy of the company, according to its top-management, not to load a subcontractor/ancillary , more than 30 to 40 per cent of its work in order to encourage diversification of the ancillaries as a counter to market fluctuations. Recently, Philips has stepped up more

90. See Goyal, Rao and Kumar, op.cit.p.107.

91. See "Philips and its small-scale ancillaries: A Case Study of Philips India Ltd.", in BCCI, op.cit.pp.123-34; H.P.Kanga,"Development of Small scale Ancillaries: A Conscious Management Effort", *Laghu Udyog Samachar*, April 1979 pp.17-19.

significantly subcontracting alongside modernisation and automation programmes at its plants because of the mounting labour militancy at its plants in the form of go slow, work to rule, disruptive walkouts and solidarity strikes as a protest against the company's imposition of productivity loads.[92]

Similarly, Murphy's radio production, domestic sales and exports were unaffected despite a protracted lock-out in early '80s because of extensive subcontracting out.[93] All other private sector organised units have also subcontracted radio production to avoid excise taxes, reduce overhead and labour cost in the face of cut-throat competition from the small-scale units located in Delhi, Calcutta, and Punjab. The whole of NELCO's radio production has been

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92. See the report by Michael Jacobs, "Philips takes hard line in India", Electronics Times, January 17, 1985, reproduced in IRENE (Industrial Restructuring Education Network, Europe), Oxford, August 1985 pp.9-12. He observed that "during the past three years, Philips India has been subcontracting an increasing amount of its production to 'third parties' (as well as ancillary services such as security, warehousing, catering, cleaning and transport). About 40 per cent of the company's turnover now represents third party activities. Half of Philips' brand name radios sold in India are not manufactured by Philips at all." When recently a strike at its Pune factory disrupted component supplies from there to its Calcutta factory, Philips subcontracted the production of those components so that the Calcutta factory was no more affected with uncertainity of supplies.

93. Bharat Bhushan, "Ancillarisation......", op.cit.p.81

put out. In this competitive milieu a state unit such as Keltron (which enjoys excise exemption upto Rs.50 lakhs worth production unlike the private units) has also embarked on putting out to women's co-operatives and welfare societies. Also, Keltron's radio unit (in the small scale sector) procures certain plastic, mechanical, electrical items on subcontract from other small units.[94]

After-sales servicing--a specialized activity and very important in the marketability of consumer electronics products -- is also considered to be amenable to subcontracting. Most manufacturers seem to organise themselves servicing individually in different parts of the country instead of depending on servicing small units managed by technically qualified personnel who can undertake servicing on behalf of different manufacturers for different products on subcontract.[95] In certain areas of market growth in Indian TV industry , aftersales-servicing has been farmed

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94. Interviews with the Senior Marketing Manager, General Sales Division, Keltron 1985. Recently Keltron has brought out low-cost radio models such as 'Kamal' (with optimum design and component structure) which are of high quality but priced at the same rates as the Delhi/Calcutta small units; Also interviews with T.J.Menon, Small Industry Development Division, Keltron 1985. According to him, if the average labour cost per day is Rs. 5 in Delhi/Punjab small units, the average labour cost per day is Rs.10-15 per day at women's co-operatives doing assembly work for Keltron and the average labour cost per day is Rs.40 at Keltron's main units. In addition, the overhead differential is substantial between Keltron's main units and subcontractrs; A study of women workers assembling radio sets for Keltron has been conducted by Gita Sen and Leela Gulati ("Women workers in the Electronics Industry in Kerala", ILO-funded project, Geneva, forthcoming) at the Centre for Development Studies.

95. R.C.Chopra and G.Rai, op.cit.p.7

out for subcontracting.[96]

In the field of professional electronics too, various levels of subcontract in fabrication and assembly (involving different levels of technology and skills) can be identified and farmed out. In fact, established companies and organisations such as BEL, ITI, ICIM, VSSC/ISRO claim to have identified various items on the basis of group technology concept and farmed them out for subcontracting to small-scale units. There also exists subcontracting between bigger organised units themselves (for example, BEL subcontracting to private units as well as state units such as Meltron and Keltron and VSSC/ISRO subcontracting to Keltron).[97]

In Indian computer industry, " effective subcontracting has not yet begun" because of low-volume production, most of it in the form of mere assembly of imported CKD hardware and software packs; also because of the alleged lack of close interaction between a manufacturer and a possible subcontractor and quality control of the ancillary units' items. In the field of software, Indian manufacturers

96. In 1981, "while all companies in Delhi and Calcutta were offering after-sales servicing through their own service technicians, in Bombay about 25 per cent of after-sales servicing was observed to be done through contract agencies." See Keltron, Market Survey Report on Television Receiver at Bombay, Calcutta and Delhi, CMD/MPC/007/82.

97. See B.H.Ravi Kumar, Subcontracting in Electronics--BEL's Experiences, paper presented at the National Workshop on Subcontracting in Electronics 1983; "Ancillarization in Tele-Communication Industry, Working Paper III-1 and Indian Telephone Industries, Naini and Her Experience of Ancillarisation, Working Paper II-2, National Workshop.; V.P.Kulkarni, Small-scale Industry Technology Utilisation for Development of Advanced Electronics, EXCEL-84; Ancillarisation in the field of Computers and Allied Industries -- Some Experiences of ICIM, Working Paper IV-1, National Workshop....;

such as PCS, TCS, ICIM, SOFTEK supply systems software (including languages) to indigenous firms as well as foreign firms on subcontract. The spurt in computer usage in the country from the mid-70s has led to mushrooming growth of big and small software ancillaries and data processing houses which take up subcontract work.[98]

In the field of defence electronics, there is some sub contracting to small scale units from Airforce, Navy and Army.[99] In CIIE, small units subcontract from large units undertaking turn-key jobs.[100] In medical electronics, the equipment manufacturers can procure products (like transducers, electrodes, mechanical hardware, circuit boards, accoustic stethoscope, electrical fitting and accessories etc.) and servicing (for defective equipment) on subcontract.[101]

In the components sector, as stated earlier, there are a good number of subcontractors and ancillaries in entertainment electronics field. But in professional electronics, ancillarisation of components in general is not possible due to rapid obsolescence and high capital

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98, See Ancillarization in Microcomputers and Micro-processor based Systems, Working Paper IV-2 and Ancillarisation of Microprocessor based data processing systems in India, Working Paper IV-4, National Workshop....; In applications software, development of the package is said to be more amenable to ancillarisation than its installation.

99. Subcontracting : Defence Professional/semi-professional electronic equipment and stores, Working Paper IV-3, National Workshop...

100. "Report of the Planning Commission Working Group on Electronics industry..", Electronics, Information and Planning, Vol.6, No.1, 1978.

101. The Electromedical Equipment-Possible Ancillarisation, Working Paper II-2, National Workshop....

investment requirements. There is no subcontracting of labour intensive (assembly) operations in the manufacture of semiconductors in India. While many integrated circuits have been imported the indigenous makers such as BEL and ITI have set up integrated/captive plant facilities for the manufacture of SSI/MSI(Small scale integration/medium scale integration) integrated circuits.[102]

In R&D activity, the indigenous laboratories and manufacturers subcontract (power supplies, printed circuit boards, transformers, many low volume complexities) to small units significantly in order to step up their productivity.[103]

The central point of the foregoing analysis is that the scope for subcontracting in electronics lies in the industry's interlinkage with other branches of engineering (mechanical and electrical) and with chemical(compounds, greases, varnishes etc) and plastic industries in the process of bringing out an end-product. No manufacturer has all the machinery and facilities in-house to make each and every item. The end-producers would concentrate

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102. The volume of indigenous production has been very low and the consequent cost very high. See S.C.Mehta and G.S.Varadan, "State-of-the-art of microelectronics in India", Electronics, Information and Planning, Vol.11. No.8, May 1984.

103. Subcontracting in Electronics R & D Activity, Working Paper II-2, National Workshop....

generally on research, design and development, final assembly and testing; they may do some in-house production of (or import to some extent) materials and component parts. They would purchase standard items from large/ medium firms and subcontract several items within certain dimensional limits and having certain output parameters.[104]

Such vertical disintegration has many advantages to the main electronics firms such as (a) economies of large-and small-scale, (b) access to specialised technology and machinery, (c) low lead time,[105] (d) facility to phase out current operations by creating supplementary capacities in small units (as exemplified by ITI in the production of electromechanical exchange lines), (e) high productivity and quality ensuing from specialisation in labour intensive operations at the subcontractors/ancillaries, (f) reduced investment, less inventory of rawmaterial, reduced work-force and so fewer labour-management problems and reduced

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104. These could be sheet metal items (like chassis, racks, drawers, antenna, electromechanical assemblies, castings, modules), plastic components, cabinets and decorative parts, various subassemblies/modular sub-systems, electrical items, specialist jobs and common services (like electroplating, heat treatment, foundry, painting, packaging etc), testing, servicing (software consultancy, maintenance, after-sales servicing, servicing of defective electromedical equipments etc.)

105. This is because man-hours required per unit of output are lower in small units because of closer supervision whereas multiplicity of departments in a large firm causes delays and inflexibility.

risks on loss factors such as damage, wastage, and more importantly, obsolete tools/jigs, machinery etc.[106] Apart from these positive advantages, there are certain compelling reasons for its spread in India as will be seen from the discussion on television industry that follows.

Section 4: Television industry and Subcontracting

Television industry is a new entrant in Indian industrial structure. Commercial production of television sets began in India only from 1970.[107] As Table 2.9 shows , the production of TV sets grew at the average annual growth rate of 30 per cent and the number of TV sets held in the country at the end of each year (i.e.the number of sets in use in the beginning of the year plus the production during the year)grew at the average annual growth rate of 15.5 per cent.

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106. See Healthy Growth of Ancillary Units for Electronics, Working Paper I-4; also see Working Paper V-4, National Workshop on Subcontracting in Electronics, New Delhi, 1983.

107. A good introduction to this industry could be obtained from R.C.Chopra, "Current Status and Growth Prospects of TV industry in India", Electronics, Information and Planning, Vol.3,No.6, March,1976; R.C.Chopra, "Current Status, Problems and Growth Prospects of TV industry", Electronics Today,Vol.13 No.2 February 1980; R.C.Chopra, and S.L.Sarnot, " Low-cost Television Receivers", Electronics,Information and Planning, Vol.3 No.7, April, 1976;LINTAS, Television in India, compiled by the Media Department, India January 1984; B & W TV: A Demand Forecast 1984-88 by Lt.Col.J.C.Sarin (retd.), Consultant.

Table 2.9

Growth of T.V. Industry

Y e a r	Production during the year (no.of sets manufactured)	No.of sets held in the country at the end of the year
1966	--	4,170[a]
1969	--	12,300[b]
1970	14,406[a]	--
1972	--	61,000[c]
1973	75,066	--
1974	76,538 [d]	2,75,381
1975	97,000	1,87,000
1976	1,44,000	3,31,000
1977	2,39,000	5,70,000
1978 [c]	2,70,000	8,40,000
1979	3,10,000	11,50,000
1980	3,70,000	15,20,000
1981	4,35,000	19,55,000
1982	5,70,000	25,25,000
1983	7,25,000[f]	32,50,000[f]

Source: (a) R.C.Chopra (1976),p.455,457
(b) N.L.Chawla, "Television Expansion Plan-I" Financial Express Sept.6,1983.
(c) LINTAS,op.cit.
(d) Chopra & Sarnot (1976),op.cit.p.534.
(e) B & W TV: A Demand Forecast, op.cit.p.4
(f) estimated in ibid.

The size distribution of Indian television industry is long-tailed. In mid-70s there were about 10 units in the organised sector and 57 units in the small sector. In early '80s, the number of small units increased to around 90 while there was no change in the number of organised units.[108]

The growth of this industry has been primarily a function of two parameters: (a) hardware and software of broadcasting facilities (i.e. TV service expansion programme and quality of programmes broadcast) and (b) retail prices of TV sets.

The main problem of the industry since its commercial inception, especially during 1973-75, was poor quality of TV sets, escalation in their prices, and the consequent poor offtake. The period 1973-75 saw increase in the number of small units as also in their relative market share vis-a-vis the organised units. But in 1975, demand

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108. We must note that the demarcation between organised and small sector is diffused and rather misleading too. For, the monochrome or black and white TV manufacture involves only assembly with hand-wired chassis (and hence the sets are handicraft) and testing. The fixed capital investment requirements are low (between Rs.3 to 10 lakhs, especially on test instruments). However, the working capital requirements are very high (because of stocking of components and finished products) so much so that the total productive capital requirement is between Rs.10 to 20 lakhs.

slumped and as many as 50 units closed down.[109]

High cost-price structure

The analyses of cost-price structure of the industry that came out in mid-'70s revealed the following anti-growth factors.[110] There were diseconomies due to very low levels of production. This was due to large-scale issue of licenses to small units on the grounds that the industry was free of scale considerations[111] and that it had a

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109. See AIEI, Background Paper...., op.cit.pp.20-21;A.Razzaque op.cit.p.53; Chopra and Sarnot(1976),op.cit.p.533.

110. See "Summary of the Report of the Panel on Cost and price structure: Evaluation of Television Receiver Industry", Electronics, Information and Planning, Vol.5,No.4,January 1978 pp.224-66 (hereafter Panel on Cost and Price Structure 1978); "Interim Report of the Panel on Guidelines for Price, Distribution and other controls in the Electronics Industry", Electronics, Information and Planning, Vol.4,No.3 December 1976, pp.151-89 (hereafter Interim Report 1976); AIEI,Background Paper...op.cit.; Michel Neri, op.cit.

111. Because of low capital investment and low assembly cost, production volume is said to be non-critical; there is no economic advantage from increasing scale beyond 25,000 sets per annum, according to Chopra and Sarnot (1976), op.cit. pp.533-34, 541-42; Panel on Cost and Price Structure(1978) op.cit.p.251; In 1972, an empirical study by the Information, Planning and Analysis Group of the Electronics Commission put the techno-economic upper bound on production at 80 sets per day, i.e. 20,000 sets per annum. But this was scaled down to an optimum production level of 7,000 -15,000 sets per annum, after giving due weightage to decentralisation and employment angles. Production at less than 5,000 sets would be uneconomic. Against these recommendations, the actuals were different; in 1977, except 4-5 organised units with a production level of more than 10,000 sets per annum, all the other organised and small units were on the average operating at uneconomical levels. See AIEI,Background Paper...op.cit.pp.20-21; in 1980s, the scale of operation of some organised units increased up to 50,000 sets per annum. But this is miniscule in comparison with the Japanese or South Korean scale of 1 million sets per annum. Michael Neri, op.cit.p.70. But such a contrast is rather odious in that while the production in India is based on demechanised technology or semi-automatic production of conventional product-design models, in the international market the production of innovative models incorporating super chips are produced on a large-scale with automated techniques.

particularly high employment potential per unit of capital invested and high output to capital.

In the pre-mid-'70s period, there were three types of TV sets: tube and value version, solid state version and hybrid version (which was dominant). But the trend in post-mid-'70s period was distinctly towards the solid state or transistorised version. The point is that individual designs led to high cost of small-batch procurement of varied components. Locally made components were not only substandard but also more expensive than the imported ones. The component cost was high because of the diseconomies of the component-makers.[112]

Also, high prices of input materials and components increased costs of production. The prices of components such as picture tubes, deflection components, multichannel tuners were high because of diseconomies of scale plus high import duties. The picture tube constituted about 40 per cent of the total components bill. Further, the manufacturers

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112. See R.C.Jain, "Indian Standards for TV industry", Electronics Today, February 1980, pp.28-33; Also see the editorial in Television for You, Vol.II,No.8 1978; Television for You, Vol.13, No.12,December 1978; Breakdown of sets led to increase in expenditure on after-sales service because of lack of proper test instruments and assembly aids for quality control.

used expensive wooden cabinets with highly decorative features[113].

High costs and prices were also significantly due to high taxation on TV sets. The multiple taxation (direct and indirect) of raw materials, components, and finished products led to pyramiding of duties and taxes. In 1978, 65 per cent of the ex-factory price of an average TV set was due to taxes.[114]

High costs of marketing high-profit-margin-sets with decorative cabinets plus non-essentials like multi-channel turners etc., pushed up the unit prices.[115] Moreover, production cost per set rose because of multiplicity of brand names as also of hundreds of models (each manufacturer with 5 to 10 or more models).

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113. Interim Report (1976),op.cit. pp.154-57, 176-77; Chopra and Sarnot (1976),op.cit.p.535-539 and 541; Panel on Cost and Price Structure (1978),op.cit. pp.256-57. In India, wooden cabineting was encouraged because of the availability of raw materials and employment and easy-entry considerations. This is in contrast to large volume, low-cost production of plastic moulded cabinets in developed countries and some Newly Industrializing Countries where the wooden equivalent is costlier.

114. Chopra and Sarnot (1976),op.cit.p.537. The TV industry became a major source of revenue for both Central and State governments through taxation plus license fee. See R.C.Chopra (1980), op.cit.

115. Marketing cost can be disaggregated into costs of publicity and advertisement, service station expenditure(for servicing during the warranty period), travelling expenses plus freight charges (or packing and forwarding) and high discounts to dealers/distributors.

High prices were also due to high cost of TV accessories (such as antenna, feeder cable, voltage stabilisers etc). The selling cost of the accessories was highly disproportionate to their manufacturing cost because of the restrictive trade practices that linked specific brands of sets with specific brands of accessories as the sole assurance of quality and performance.

Manufacturing/assembly costs[116] varied between units and accounted for 10 to 15 percent of an average set's ex-factory price; manufacturing overheads were particularly found to be higher. Further, all the units were found to be making excess profits (realisation) when their selling prices were compared with a 'fair price' (ex-factory price including distributor's margin).

In sum, the Panel on Cost and Price Structure concluded that "eventhough the number of units in production increased from 26 to 54 in 1975, contrary to general beliefs, competitiveness could not force the manufacturers to lower the unit price. The TV industry represented a typical case where the manufacturers would rather favour a relatively

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116. That is, wages plus salaries plus manufacturing (factory and administrative) overheads.

smaller turnover and larger profits per set."[117]

It follows from the foregoing discussion that in mid-'70s , the television set was not a mass consumption item because of its high cost and price. Consequent upon the 1975 slump, the manufacturers demanded a cut in excise, sales tax, cost of picture tube etc. Accordingly, the government reduced the price of picture tube, import duty on raw materials and devised a differential excise policy whereby TV sets priced at or less than Rs.1800 would be excised at 5 per cent whereas sets priced above that amount would be subject to 20 per cent excise.

However, the Interim Report and the Panel on Cost and Price Structure[118] pointed out that the effect of rationalisation of duties in stimulating demand would only be marginal and that there existed ample scope for the manufacturers themselves to slash costs and bring out functional and utility sets.[119]

117.See Panel on cost and price structure(1978)op.cit.pp-255-56(emphasis supplied). That the manufacturers in the industry in general tended to be too fat to be swift and mobile enough to cut costs in a protected sellers market was also pointed out in Deodhar and Vaidya,op.cit.pp.36-37.

118.Note that both of them were set up by the Chairman, Electronics Commission to suggest ways of price reduction.

119.They suggested the use of simple cabinet designs,reducttion in the number of models, manufacturing overheads, marketing cost, quality control at production stage itself, price control on components, discouragement of restrictive trade practices(in regard to accessories)and reduction of their prices through subcontracting to small units, reduction of prices of components, freezing of designs to ease servicing and maintenance,standardization of design parameters/circuitry, mass production of standard components and limited number of brandnames.

Imperative for low-cost rationalisation

In the light of its meticulous inquiry, the Panel on Cost and Price Structure advocated low-cost rationalisation of the industry via re-organisation of the size distribution of units and the competitive relations between the big and small. It suggested that a few large units with adequate technical, financial and managerial sources should specialise in designing, testing/quality controlling and marketing and selling of the sets and subcontract assembly operations to small units.[120]

The mid-70s crisis also brought out a few studies that suggested possibilities of high-quality/low cost and efficient sets on the basis of alternative superior design[121] or cheaper design[122] that would replace or modify the

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120. This reorganisation via commercial subcontracting would obviate the acute marketing problem of several units producing around 2500 sets per annum. These units incurred higher prices for low-volume requirements of components but had to fix their selling prices less than or equal to prices of the bigger units making more than 10,000 sets per annum. Such reorganisation was also suggested by the "Report of the Planning Commission Working Group on electronics, Report of the Subgroup on consumer electronics", Electronics, Information and Planning Vol.6, No.1, 1978 pp.26-40.

121. See A.Radhakrishna, "Towards a solid state television screen", Invention Intelligence, March 1976, pp.100-102. This study suggested replacement of conventional picture tube by an array of semiconductors called light emitting diodes (LEDs);

122. See V.S.R.Subramaniam, "Techno-value analysis for television cost-reduction", Invention Intelligence, Vol.II, No.4, April, 1976. He suggested standardization of the picture tube and TV set at a small size and the enlargement of the picture via optical magnification method.

picture tube. But these studies seem to have been only of academic value.

Emergence of Subcontracting and technological change in television industry

Though the long-tailedness of the industry remains unchanged, commercial subcontracting betwen organised and small units seems to be a growing phenomenon of the '80s. Industrial subcontracting, on the other hand, of less sophisticated items developed in the '70s itself. Vertical integration is just not possible because of the diverse nature and varied quantities of parts and components. The television industry has the highest per unit requirement of components in consumer electronics. As a result, the assemblers have tended to buy out standard/special components from large/medium firms and less sophisticated components/subassemblies etc., from subcontractors/ ancillaries. Further, the '80s also witnessed the trend of reducing costs via simplification of design structure and component count and substitution of low-cost components for high cost ones.

Structural changes, Supply and Demand factors and implications for subcontracting of the commercial type

As the market for high-cost black and white TV sets got saturated by the late '70s, two structural changes followed: first, a distinct trend since 1980 towards the

the introduction of low-cost TV sets (economy or portable or 12-inch/14-inch small sets) in order to capture the vast middleclass market. Product market saturation resulted in stiff price and non-price competition;[123] Secondly, diversification of product range away from monochrome models towards colour sets began with the introduction of colour transmission in 1982 and industrial and licensing policy for indigenous production of colour sets in 1983.[124]

Production increased with the introduction of low power transmitters (LPTs) in 1982. In 1983, the government announced radical policies affecting growth, structure and cost of production of the industry, by way of Special

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123. See Keltron, Marketing Probe, GDS/MP/C1/1984 (Classified);"Colour TV : After Asiad what ?" Business India, September 27-October 10, 1982,p.83 and passim

124. Initially, in order to cover the Asian games, ETTDC imported CKD kits from Samsung and Goldstar of South Korea and ITT of West Germany and distributed them among the manufacturers for 'screwdriver' assembly. In 1983, licenses were issued to a large number of big and small units in private and public sectors. Colour set production began in 1984 with several firms entering into foreign technology collaboration agreements, although indigenous knowhow was developed by Central Electronics Engineering Research Institute (CEERI, Pilani), Central Electronics Ltd., and the Council of Scientific and Industrial Research (CSIR). See "Annual Report (1982-83) of DOE",Electronics Today, op.cit.p.46; "Report of the Working Group on Colour Television", Electronics, Information and Planning, Vol.7,No.12,1980; "Parliament News", Electronics, Information and Planning,op.cit.p.627, 663; DOE, Industrial and Licensing Policy for Colour TV sets (25-2-1983) in Electronics, Information and Planning, July 1983 (Appendix I).

Television Expansion Plan[125], capacity liberalisation to meet the tremendous market expansion that would follow[126] and fiscal concessions to bring down colour TV prices[127].

In this context, whether the growth of production and demand for TV sets would pick up commensurately with the Special Plan targets depended on (a) the availability of picture tubes (to suit the different circuits designed by

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125. Needless to say, while this Plan was intended to usher in an "explosion"of television medium in the country, it must also be seen in the political backdrop of the then ruling Congress (I) Party's power interests. The objective of the Plan was to feed Delhi programmes to a ramified network of high power transmitters (HPTs) and LPTs via INSAT I-B for relay throughout the country. The TV coverage was targeted to expand to 70 per cent of population (from the previous 19 per cent) and to 20 per cent of area (from the previous 6.5 percent). See N.R.Chawla, op.cit; LINTAS,op.cit; The Economic Scene, op.cit.p.62; "Industry: Television sets", UPDATE, April 25-May 1, 1984 p.22.

126. Capacity ceilings were virtually lifted to expand and reduce per unit production cost. For the organised units, the licenced capacity was enhanced to 40,000 sets per annum and for the small units, the minimum approved capacity limit was stepped upto 10,000 sets. See UPDATE,op.cit.p.22. About 40-90 units in the organised sector and 200-375 small units were given licences. See The Hindu, May 3,1984 p.6; "Television: The great leap forward", Business India, June 18-July 1, 1984, p.89. Licences were also granted for large-scale indigenous manufacture of color TV picture tubes. But the indigenous production has been low(with the consequent high cost-price), contributing to only a fraction of the requirements of the industry.

127. Excise duties and customs duty on imported components and on materials imported by component manufacturers were brought down to reduce color TV set prices.

the manufacturers)[128] and components at optimum cost, (b) reduction in per unit production cost and price and (c) improvement in quality of sets, software and after-sales-servicing at reasonable rates.

In 1984, unsold stocks of TV sets increased and a price war began as the buyers postponed their decisions to buy with the expectation of considerable price fall according to the official statements. But the low-cost sets introduced into the market were considerably costlier than the official estimates. Not only demand but also production was said to be lower.[129] However, with the expansion of Special TV transmission network, production grew till January 1985. Thereafter it slackened. The demand for 20-inch black and white sets fell substantially thereby affecting the indigenous components industry (including ancillaries/subcontractors).

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128. Initially the industry suffered from severe supply-sided constraint (in the shortage of picture tubes). The shortage of color picture tubes was acutely felt by the manufacturers who had opted for the modern, low-power consuming and highly accurate 'mini-necked' picture tubes made by the Japanese giants, Toshiba and Hitachi. However gradually, indigenous production picked up not only due to direct imports by the manufacturers but also due to canalised imports by ETTDC. In fact, ambitious production targets led to indiscriminate imports leading to stock-piling of inputs and tubes by the end of 1985. See "Television Boom Petering Out", BusinessStandard, February 1986 p.1,4.

129. See UPDATE, op.cit.; Business India ("Television:The great leap...") op.cit. Both articles referred to the poor quality of software as a significant reason for low demand.

130. See Business Standard, op.cit. According to the industry sources, in 1985 while the actual production of monochrome sets was substantially less than the projected demand of 2 million sets, the production of colour sets might be expected to approach the projected demand of 7.8 lakh sets.

The TV industry is said to experience seasonality--boom and recession--in an average year, with demand falling in January through August-September when it starts picking up till January next. But this seasonality was not seen in 1985, according to the industry sources. Demand for black and white sets stagnated and declined and did not pick up in August/September. In these circumstances, further growth of the industry was ruled out unless software improved and consumer credit system was adopted.[130]

Thus, in the light of the Hobson's choice (i.e. reduce cost-price and sell more and viceversa) encountered by the manufacturers on the one hand and seasonality and uncertainity of demand on the other, we may hypothesize that the relatively larger manufacturers may have already subcontracted the final assembly operations to or procured complete TV sets (especially monochrome sets) from small scale units instead of increasing capital investments to expand the existing facilities. Such a plausibility finds vindication in the case of Keltron which has shown recently a tendency to increase commercial subcontracting much more than industrial subcontracting.

130. See Business Standard, op.cit. According to the industry sources, in 1985 while the actual production of monochrome sets was substantially less than the projected demand of 2 million sets, the production of colour sets might be expected to approach the projected demand of 7.8 lakh sets.

Limitations of subcontracting in electronics

Although it follows from the foregoing discussion that there exists a wide range of subcontracting/ancillarisation relations in electronics, there are certain factors (besides the ones generally pointed out earlier) governing the limitations of subcontracting in Indian electronics.

Parent firms, by giving long-term loads, have reported the experience of production schedule setbacks on account of the selective execution of orders by ancillaries, that is, execution of only those items bearing higher profit margins. Moreover, pricing remains a subject of dispute. For instance, ITI's top-management has alleged that ancillaries claimed higher prices than its internal cost of manufacture, thereby leading to its erosion of profit margins.[131] In professional electronics, there is no guarantee of quality of production at optimum cost because of resubcontracting by the ancillaries as alleged by ITI, for instance again.

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131. See C.S.S.Rao, "Ancillary Development in ITI", Lok Udyog, March 1980. Incidentally, ITI has also alleged that in the past partnership problems changing the status of ancillaries caused disruption of supplies to its main units.

Long-term contracts and uniform loading is not possible in electronics at all because of changes in production-mix due to changing technology or product market changes or low production volumes etc. BEL, for example, claims to have restricted the number of ancillaries with long-term loads. ITI presents a very interesting example of the impact of technological change on subcontracting which is of considerable relevance for this study. The recent shift made by ITI in making exchange line equipment from electromechanical era to electronic era has led to the irrelevancy of its 94 ancillaries tuned to the electromechanical era. The new digital systems involve just assembly of number of critical components (resistors, capacitors, transistors, integrated circuits etc.) and subsystems which can only be made in large volumes with semi-automatic or automated processes and strict quality control and not in the small sector.[132]

Further, from the parent firms' side, there is fear of leakage of know-how to competitors. In defence projects, imports have been preferred to local subcontracting because

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132. See the Press reports: "Prospects Bleak for ITI Ancillaries" and "Editorial: Coping with Technological Change", in The Hindu, February 25, 1984 p.8, 12 and The Hindu, May 5, 1984 p.12. On electromechanical and electronic exchange systems, their merits and demerits, and their suitability to Indian conditions, see Ghayyur Alam, Performance of Imported Technology in LDCs--The Case of the Telephone Industry in India, NCAER, New Delhi 1981 (mimeo).

of ancillaries faulting on delivery schedules, quality, modifications, testing, approval of product type etc.

According to the small units in this industry, work orders are irregular and of low volume; often they are 'one-off' orders. They incur "increased tooling cost on tailor made items, making them vulnerable to loss risk in case of cancellation of contracts within short period.... There are instances of officials of public sector units grooming individuals or new units with doubtful interests in the venture (especially when the jobs are highly remunerative) and offering items of low requirements and high tooling investment etc., to other units in general without guaranteeing continuity to help recovering tooling cost."[133]

In defence electronics, parent firms do not provide full technical details and specifications; there are many agencies to get products certified and approved; evaluation, testing and users' trials take a long time. Further, generally, small units cannot afford expensive calibration and testing equipments; they do not have control on the rising costs and the scarcity of quality of rawmaterials;

133. See "Subcontracting by Small and Tiny Sector: Today and Tomorrow, working paper V-3 and Facilities and Problems in Subcontracting in Electronics, Working Paper V-6, National workshop on subcontracting in Electronics.

and the rise in costs is not usually incorporated in the prices dictated by the parent firms.

Thus, when small units in electronics have to bear the adjustment costs of obsolescence, technological specialisation, demand fluctuations, uneconomical and uncertain orders etc., diversification (of products and customers) becomes extremely important for their survival and viability.

The problems of subcontracting in electronics as noted above are examined with an illustrative study of television production of Keltron and its small-scale subcontractors in the ensuing chapters.

CHAPTER 3

KELTRON AND ITS TELEVISION PRODUCTION

Introduction

In the backdrop of the growth and competitive structure of the television industry in India, this chapter analyses the performance of the Kerala State Electronics Development Corporation (Keltron) -- the first state government unit to enter electronics field -- and examines its 'make-buy' policy with regard to TV production. The objective is to bring out the process, conditions and motivations shaping up its strategies in relation to industrial and commercial subcontracting. The analysis is primarily based on a study of Keltron's main TV-making plant. The discussion is divided into three sections. Section 1 profiles the growth and corporate policy of Keltron. Section 2 brings into focus Keltron's TV operations. Section 3 analyses the 'make-buy' policy with respect to TV operations.

Section 1: Keltron and Electronics in Kerala

Kerala has made considerable progress in terms of social indicators of development. Its achievement in literacy standards and health status has earned international recognition of the "Kerala Model" of development. However, its economy is faced with problems of low growth rate and teeming unemployment. While there is large scope for the development of skill-intensive activities, the lack of modernisation and diversification of the industrial base of the State have, inter alia, contributed to the retardation of the growth of the regional economy.

That the State is one of the industrially backward (stagnating) States in the country is reflected in the rate of growth in the value added by manufacture being less than that of all-India. Also, as a proportion of national total, Kerala's manufacturing accounts for a share that is below its population base. The slow pace of industrialisation has been due to the lop-sided (concentrated) industrial structure; the development of engineering industry has been rudimentary.[1] Hence the development of modern small-scale industry has been relatively marginal and the subcontracting connection of small sector with large industries has been limited. Many of the established modern industries are chemical industries, whidh do not have much scope to develop ancillaries[2].

1. See K.K.Subramanian and P.M.Pillai, Kerala's Industrial Backwardness: An Exploration of Alternative Hypotheses, Working Paper No.210, Centre for Development Studies, Trivandrum August 1985; For an historical perspective, see T.M.Thomas Isac & P.K.Michael Tharakan, An Inquiry into the Historical Roots of Industrial Backwardness of Kerala--A Study of Travancore Region, Working Paper 215 Centre for Development Studies, 1986.

2. See M.A.Oommen, Small Industry in Indian Economic Growth A Case Study of Kerala, Research Publications in Social Sciences, Delhi-6, 1972pp.142-144.

In these circumstances, Keltron's initial objectives were to set up all over the State a number of electronics manufacturing/assembly units with smaller investments by utilizing the large pool of readily available technical and non-technical labour. The aim was also to build up a technical cadre (or 'technical knowhow generating centre') for integrated development of electronics industry as a whole, and to offer technical, financial and marketing assistance to set up industrial enterprises, specially in the small-scale sector, and thereby promote industriali-zation. Viewed in that way, Keltron was established in early '70s to play a catalytic role in the industrialisa-tion of the region.[3]

Keltron today is one of the leading electronics firms in the country, with a complex organisational structure as shown in Chart 1. Apart from several direct projects which the Corporation has undertaken directly at different plants, there are numerous indirect projects[4] taken up by

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3. For an introduction to the idea and formation of KSEDC, see Govt.of Kerala, Examination of the Working of KSEDC by Public Undertakings Committed; Satish Kumar, Electronics Industry in Kerala--Present Status and Growth Perspectives, Seminar on Sixth Five Year Plan of Kerala, Indian School of Social Sciences, January 30,1981; The World of Keltron (a brochure brought out by KSEDC's Public Relations Dept);

4. For details about the direct and indirect projects, See List A and List B in Appendix I. This information is culled out from Govt.of Kerala, Examination of the Working of KSEDC ...., op.cit.p.10, Keltron, Annual Reports for the years 1974-75, 1980-81, 1981-82 and 1982-83; Keltron News, March-April 1983, Keltron, Market Probe, GSD/MD/01/1984 (classified); K.P.P.Nambiar, "Vast Potential for Consumer and High Tech-nology Electronics", The Hindu, May 27, 1984 p.22; "Keltron Digital Watch Production From October", The Hindu, July 9, 1984 p.12; Keltron News, September-October 1981; Keltron News, July-August 1982.

its 7 subsidiary and 5 associate companies. The subsidiary/associate companies[5] concentrate on the production of active and passive components. In addition to the items manufactured by the Corporation and its subsidiary/associate units, the Corporation "also handles those manufactured by outside companies who supply products to the technical specifications and quality-standards laid down by the Corporation . All the products are marketed under the brand name Keltron."[6] Thus, KSEDC has been practising commercial subcontracting since its inception. Furthermore, the direct and some indirect projects have given rise to 'industrial subcontracting".

All the production units, where the direct and indirect projects are carried on, are located in rural/semi-urban environments in different districts of the State.[7]

5. Essentially, a subsidiary is one in which KSEDC holds 50 per cent equity/share and an associate company is one whose management is controlled by KSEDC. The associate companies are joint-ventures/joint-sector projects. The corporation provides the subsidiaries as well as the associates with technical knowhow, equity participation in full or in part, term-loans, temporary loans/bridge loans when they are unable to get immediate aid from financing institutions/banks, facilities for product testing and for test marketing and marketing outlet via the General Sales Division. See Keltron, Annual Report 1979-80, p.4; Annual Report, 1980-81, p.3.

6. See Keltron, Annual Report 1974-75 ,p.12(emphasis supplied)

7. The production plants are situated in the following districts: Trivandrum, Quilon, Kottayam, Allep[illegible] Wyanad, Cannanore, Palghat, Malappuram, and parts of North Kerala.

Chart 1

- KSEDC
  - GENERAL SALES DIVISION
  - TESTING & DEVELOPMENT CENTRE
  - RESEARCH & DEVELOPMENT CENTRE
  - MATERIALS DEVELOPMENT CENTRE
  - CENTRAL TOOL ROOM
  - DIRECT PROJECTS: (1)Television, (2)TV systems, (3) Digital Electronics, (4) Industrial Electronics, (5) Control Instrumentation, (6) Printed circut Boards, (7)Metallized dieelectric film, (8) Control Values, (9) Analytical Instruments & Data Acquisition systems, (10) Computers, (11) Telecommunication, (12) Electronic watches, (13) Medical Electronics, (14) Memory chips and (15) VCRs and Colour TVs.
  - INDIRECT PROJECTS
    - ASSOCIATES
      - (1) KELTRON COMPONENT COMPLEX LTD.
      - (2) KELTRON FERRITES LTD.
      - (3) KELTRON VARISTORS LTD.
      - (4) KELTRON PROJECTORS LTD.
      - (5) KELTRON ENTERTAINMENT SYSTEMS LTD.
    - SUBSIDIARIES
      - (1) KELTRON CRYSTALS LTD.
      - (2) KELTRON MAGNETICS LTD.
      - (3) KELTRON POWER DEVICES LTD.
      - (4) KELTRON RECTIFIERS LTD.
      - (5) KELTRON COUNTERS LTD.
      - (6) KELTRON RESISTORS LTD.
      - (7) DIELECTRIC MAGNETICS LTD.
  - COMMERCIAL SUBCONTRACTING
  - INDUSTRIAL SUBCONTRACTING
  - PURCHASING

The geographical decentralisation of production plants has been a characteristic feature of Keltron's strategy. According to the top-management of Keltron, over the decade 1973-83, productive decentralisation on the above lines generated direct employment for about 4,000 persons and indirect employment of three or four times that number through ancillary, small-scale units, women's societies, dealer network, sales and service and other related activities.[8]

It is interesting to note that Kerala's electronics production in 1971-72 was confined to two units in the private sector. With the entry of Keltron, the value of Kerala's electronics production (components plus equipment) as a proportion of the national production increased from a meagre 0.25 per cent in 1971-72 to about 2.5 per cent by the end of 1980 (See Table 3.1). Keltron's contribution to the development of electronics in Kerala is thus significant.

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8. See Keltron, Annual Report 1981-82, p.18; The targeted turnover of Rs.100 crores by mid-80s was supposed to generate direct employment of 40,000 persons and the targeted turnover of Rs.1000 crores by 1990 was expected to generate direct and indirect employment to more than 4,00,000 people in the State. See The World of Keltron and K.P.P.Nambiar, op.cit.

Table 3.1. Electronics Production in Kerala (in Rs.crores)

Year	Production in Kerala	National Production	Kerala's share in national production (Col.2 as % col.3)
(1)	(2)	(3)	(4)
1971-72	0.50	185.00	0.25
1975-76	4.90	364.00	1.35
1976-77	6.987	407.00	1.72
1977-78	10.305	504.50	2.05
1978-79	12.00	590.00	2.03
1979-80	16.00	695.00	2.30

Source: Satish Kumar, op.cit. p.1,3.

It is a moot question whether or not the strategy of decentralised production, either in terms of subcontracting or in terms of spatial dispersal, has led to Keltron's growth and expansion. It remains but a fact that Keltron has become a "fast growing and dynamic techno-commercial network" in electronics in the country. To illustrate, the sales turnover of Keltron (at current prices) expanded at an average annual growth rate of 18 per cent during the period 1974-75 to 1983-84 (See Table 3.2).

Keltron's growth has also been accompanied by changes in product-structure. Table 3.3. shows that consumer electronics has been dominant up till 1980-81. With the commissioning of the Control Instrumentation project, the

Table 3.2. Keltron's sales turnover
(in Rs.crores)

Y e a r	Sales Turnover	Annual % growth rate
April 1974 - 1975 March	0.96	--
" 1975 - 76 "	2.05	+113.5
" 1976 - 77 "	3.11	+ 51.7
" 1977 - 78 "	4.40	+ 41.5
" 1978 - 79 "	5.55	+ 26.1
" 1979 - 80 "	10.25	+ 84.6
" 1980 - 81 "	16.50	+ 61.0
April 1981 - 82 June	28.01	+ 70.0
July 1982 - 83 June	26.50	- 5.0
" 1983 - 84 "	41.73[a]	+ 58.0
Average Annual Growth rate (1974-75 to 1983-84)		18.0

a. Proposed Sales turnover for the year 1983-84 (July-June) was Rs.41.73 crores (excluding Keltron Controls Division) approximately.

Source: Management Information Report on Sales, p.2, Branch Managers Annual Sales Conference 1983-84, compiled by Market Planning Group, Keltron (classified) Ref. MP/MIR/027/83 dated 27.7.1983.

Table 3.3. Keltron's Sales: Product- groupwise (Rs. lakhs current prices)

Year / Product Division	1979-80 Sales	1979-80 %ge share	1980-81 Sales	1980-81 %ge share	1981-82 Sales	1981-82 %ge share	1982-83 Sales	1982-83 %ge share	% point change from 1979-80 to 1982-83
Consumer Electronics	464.58	(44.37)	577.49	(34.32)	578.28	(24.85)	994.14	(37.16)	-7.21
Components	221.50	(21.15)	304.20	(18.08)	516.24	(22.19)	503.924	(18.83)	-2.32
Digital & C.C.T.V.[a]	36.90	(3.52)	22.14	(1.31)	61.607	(2.65)	73.35	(2.74)	-0.78
Industrial Electronics	77.98	(7.43)	56.86	(3.38)	151.900	(6.53)	202.234	(7.56)	+0.13
Electromechanical	85.06	(8.12)	104.94	(6.24)	74.080	(3.18)	81.145	(3.03)	-5.09
Keltron Controls	--	--	507.42	(30.16)	850.00	(36.53)	693.00	(25.91)	-4.26[b]
Others	161.47	(15.41)	109.46	(6.51)	94.87	(4.07)	127.523	(4.77)	-10.64
	1046.98	(100.00)	1682.51	(100.00)	2326.978	(100.00)	2675.313	(100.00)	

a. close circuit television
b. Applies to the period 1980-81 to 1982-83.

Source: Management Information Report on Sales for 1980-81 (April to March), May 1981 (Annexure 2); for 1981-82 (April to March) Ref. MPC/MIR/450 27.4.82 p.27 for 1982-83 (July-June) Ref. MP/MIR/027/83 27.7.83 p.2. Marketing, Planning & Co-ordination Group, Keltron.

Keltron Controls division emerged as the dominant contributor to total sales during 1981-82. However, with the fall in the sales turnover of Keltron Controls in 1982-83, consumer electronics emerged once again as the major contributor to total sales, followed by Keltron Controls and Components in that order. In relative terms, consumer electronics, however, declined by 7 percentage points between 1979-80 and 1982-83; Keltron Controls too declined relatively by 4 points over the period 1980-81 to 1982-83.

Keltron's corporate policy on subcontracting

Generally, it has been the policy of Keltron to concentrate on sophisticated items involving critical technology at its main units and to phase out on subcontract the manufacture of less sophisticated items to small-scale units. Keltron initially procured almost all the rawmaterials components etc., from sources outsideKerala. However, in course of time, it began to encourage the local ancillary units" so as to ensure that the maximum number of items are produced in Kerala itself."[9] The number of these units was around 60 by 1977-78 which increased to around 200 by 1980-81 and to more than 250 in 1982.[10] Concurrently, the

9. Keltron, Annual Report 1979-80, p.7

10. Keltron, Annual Report 1977-78, p.8; Annual Report 1981-82, p.14, Keltron News, September-October 1981 and July-August 1982.

percentage of procurement within the State from these units increased from about 15 per cent during 1979-80 to about 20 per cent during 1980-81 and to about 25 per cent during the year 1981-82. It was expected to rise to the order of 40 to 50 per cent by middle '80s.[11]

Subcontracting linkages have been established with the local small units in relation to the manufacture of many consumer electronics and other end-products. To illustrate, on examining the Bills of Materials of different types of radio sets assembled at Keltron Entertainment Systems Ltd (KESL) --Keltron's associate company in the small-scale sector -- it became evident that KESL procured many standard/special items from big and medium-scale companies situated outside Kerala and from within Keltron grouping; it also subcontracted out to small units in and around Trivandrum and other parts of Kerala.[12] Keltron's Small-scale Industries Development Division, with the close co-operation of the State Industries Directorate, made putting out arrangements by which certain small units employing women (in the co-operative sector and also sponsored by

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11. Keltron, Annual Report 1979-80, p.7; Annual Report 1980-81, pp.1-12; Annual Report 1981-82, pp.14-15.

12. The subcontracted items included subassemblies (like radio coils), wire wound trimmers, metal parts and plastic items (cabinet front, cabinet back, pointers, durms etc).

the Central Social Welfare Board) did the assembly work of radio sets. The Corporation gave these units raw-materials and components and training on the assembly work of 2-band transistor, clock radio and economy model radio sets. Quality controlling, testing and marketing (under 'Keltron' brand and style) were done by the Corporation. This experiment conceived in late '70s fitted in well with the national scenario of rapid growth of radio receiver industry in the small-scale, unorganised sector.[13] Moreover, in early '80s, Keltron entered into commercial subcontracting arrangements with Manipur Small Industries Corporation and Pondicherry Industrial Promotion Development and Industrial Corporation for setting up radio assembly shops in those places and for marketing their sets under Keltron trademark.[14]

The putting-out arrangements were encouraged in other electronics items as well. Thus, in calculators, Keltron did tooling for plastic moulded parts and made

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13. Keltron, Annual Report 1979-80, p.7; Annual Report 1980-81, p.11; Annual Report 1981-82, pp11, 14. By mid-'84 there were 35 co-operatives employing around 600 women assembling radios worth Rs.2 crores for Keltron. According to the ex-Chairman of Keltron, "the ultimate aim is to organise at least one such society in every village." See K.P.P.Nambiar, op.cit.

14. Keltron, Annual Report 1981-82, p.14.

subcontracting arrangements for moulding them through small units. Local suppliers also developed several types of cabinets. Many small units, including women's societies, have been supplying pocket calculators, voltage stabilisers (conventional type)[15], loudspeakers, amplifiers etc., according to Keltron's design specifications and knowhow.[16]

Keltron's TV systems or Mass Communications Division (MCD) had around 15 subcontractors located within the State. MCD purchased materials and put them out to the subcontractors. This was intended to ensure high quality standards. In the case of direct reception systems, antennas were subcontracted out to firms in Madras. Cabinets, castings, viewhoods, linearity coils and main frame of TV monitors were procured from local ancillary units. Other items sub contracted locally were chassis, linearity coil and main-frame in TV cameras, machining (of joints/brackets) in environmentally protected cameras used in runways and in flame-proof cameras used in mines. Also, mainframe, helical filter (a part of radio network terminal) and other fabrication required for switchers and scanners were farmed out for subcontracting.[17]

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15. The production of the other type of stabilisers called "servo-controlled voltage stabilisers" has also been subcontracted, for example to Encotronix-a division of Encos -- with Keltron's knowhow and marketing support. See Keltron News, March-April 1983.

16. Keltrol, Annual Report 1975-76

17. Interviews with MCD middle-management/technicians at Keltron Equipment Complex.

Keltron's subcontracting practice is not confined to consumer electronic production. In industrial electronic products, about 30 to 40 per cent of structural fabrication and assembly had been subcontracted to 8 to 10 small-scale shops.[18] The Control Instrumentation project invited entrepreneurs to take their pick from a list of 56 ancillary items (mostly mechanical/moulded components) and "reap the fruits of Kerala's industrial prosperity" as the project required Rs.10 crores worth of materials/components every year. The plant maintained relationships with about 75 subcontractors. Most of them were situated outside the State. There existed a vendor rating system whereby subcontractors were rated on the basis of weightage assigned to price, workmanship and delivery period.[19]

Furthermore, the category "goods purchased for resale" or "resale items" or procurement on "trading" basis as given in the Annual Reports (under the Manufacturing, Profit and Loss Account) referred to Keltron's procurement of pocket calculators, voltage stabilisers, loud speakers, TV sets including small-sized TV sets, radio sets, stereo

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18. Interviews with the personnel at the industrial electronics division of Keltron Equipment Complex.

19. Interviews at MCD. Keltron's Control Valves factory was expected to concretise " a large potential for the development of ancillary units...which could supply to it items such as castings, forgings, turned parts and other mechanical components." See Keltron, <u>Annual Report</u>, 1980-81.

amplifier systems, cassette recorders, electrical and mechanical items etc., from outside companies -- mostly small-scale -- so as to market them with higher profit margins under its label.[20] The contribution of such items to the total sales value of all direct projects (excluding Control Instrumentation) did not exceed 10 per cent by 1983; it was 8 per cent in 1979-80, 7 per cent in 1980-81, 6.6 per cent in 1981-82 and 8.6 per cent in 1982-83 (See Tables 3.4 and 3.5).

Thus, having considered the fact that commercial and industrial subcontracting has been integral to Keltron's production of many end-items, we proceed to analyse its TV operations in particular.

The significance of Keltron's television manufacturing can be seen in two ways. First, within the consumer electronics, television has been the dominant contributor to total sales value of consumer electronic production (see Table 3.6). The relative share of television which has been declining till 1981/82 showed considerable increase since 1982/83. On the whole, television grew relatively by nearly 3 percentage points between 1979/80 and 1982/83. Secondly, among the projects directly handled

20. See Keltron, Notes forming Part of Balance Sheet as at 30th June 1983 and the Profit & Loss Account for the Year Ended that Date, p.9

Table 3.4. Projects Directly Undertaken by Keltron : Income by Sales (Rs.)

Project / Year	Television Sales	Digital Electronics Sales	Industrial Electronics Sales	Control Instrumentation Sales	Resale Items Sales	Others Sales	Total Sales
1974-75	26,27,296	98,785	20,525	--	--	33,220	27,82,326
	(94.42)	(3.55)	(6.92)	--	--	(1.19)	(100)
1975-76	91,49,459	30,24,459	9,87,318	--	--	11,05,957	1,42,67,193
	(64.13)	(21.20)	(6.92)	--	--	(7.75)	(100)
1976-77	92,72,088	31,26,242	37,75,461	..	--	21,95,015	1,83,68,806
	(50.48)	(17.02)	(20.55)	--	--	(11.95)	(100)
1977-78	1,22,56,554	51,90,501	53,73,992	--	--	11,06,597	2,45,27,645
	(49.97)	(21.16)	(21.91)	--	--	(6.96)	(100)
1978-79	1,16,56,555	61,28,679	57,14,692	--	--	22,08,135	2,57,08,061
	(45.34)	(23.84)	(22.23)	--	--	(8.59)	(100)
1979-80	2,75,56,207	41,16,753	77,96,863	--	36,91,494	13,92,859	4,45,54,174
	(61.85)	(9.24)	(17.50)	--	(8.28)	(3.13)	(100)
1980-81	3,19,69,288	47,94,105	52,00,278	--	37,49,044	87,58,752	5,44,71,467
	(58.69)	(8.81)	(9.55)	--	(6.88)	(16.07)	(100)
1981-82	3,65,04,756	80,47,921	1,82,44,423	10,34,21,389	55,14,921	1,51,36,572	18,74,69,982
	(19.47)	(4.29)	(9.74)	(55.16)	(2.94)b	(8.40)	(100)
1982-83	6,63,22,200[a]	49,95,143	2,02,46,963	6,91,53,921	91,26,043	55,74,388	17,54,18,658
	(37.81)	(2.84)	(11.54)	(39.42)	(5.21)c	(3.18)	(100)
%age point change between 1974/75 and 1982/83	(-56.61)	(-0.71)	(+10.8)	(-15.74)[d]	(-3.07)[e]	(+1.99)	

Source: Manufacturing, Trading & Profit and Loss Account in Keltron, Annual Report 1974-75,p.25; Annual Report 1975-76p.27; Annual Report 1976-77,p.32; Annual Report 1977-78,p.28; Annual Report,'78-79 p.28; Annual Report 1979-80,p.29; Annual Report 1980-81,p.35; Notes forming Part of Balance Sheet as at 30th June 1983 and the Profit & Loss A/C for the Year ended that date, p.12; Schedule 2.01 Schedule forming part of Profit & Loss A/C for the year ended 30-6-83; Management Information Report on Sales, Ref. MP/MIR/027/83 dated 27-2-83.p.9.

Note: a. The sales value of television during 1982-83 is given as Rs.5,44,32,625 in Notes forming...op.cit p.9. If we take this figure, then the share of television comes down to 31 percent.

b & c : These work out to be 6.56 & 8.58 respectively when Control Instrumentation is excluded.
d : over 1981-82; e : Between 1979/80 - 1982/83.

Figures in parenthesis indicate %age share

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Table 3.5. Particulars of Trading Items 1982-83

	Opening stock as as 1-1-82		Purchases during 1982-83		Sales during 1982-83		Closing Stock as on 30-6-83	
	Qty.	Value (Rs)	Qty.	Value (Rs)	Qty.	Value (Rs)	Qty.	Value (Rs)
Television	--	--	1941	33,01,253	1833	42,58,176	108	1,83,686
Calculators	3437	14,18,150	8298	30,75,458	7817	56,17,011	3918	10,66,972
Electrical & Mechanical Items	--	5,33,902	--	28,46,203	--	30,56,822	--	5,01,014
Total	3437	19,52,052	10,239	92,22,914	9650	1,29,32,009	4026	17,51,672

Source: Keltron, Notes forming.....,op.cit. p.9

Table 3.6. Product composition of Keltron's Consumer Electronics Sales (in Rs.lakhs)

Product group cons.Elect. / Year	1979-80 Sales	1979-80 %ge Share	1980-81 Sales	1980-81 %ge share	1981-82 Sales	1981-82 %ge share	1982-83 Sales	1982-83 % share	%ge point change from 1979/80to1982/83
Televisions	298.35	(64.22)	366.18	(63)	320.991	(55.50)	663.222	(67)	+2.78
Radios	37.56	(8.08)	82.19	(14)	116.475	(20.16)	142.286	(14)	+5.92
Projectors	38.16	(8.22)	38.36	(7)	32.834	(5.68)	47.027	(5)	-3.22
Voltage Stabilizers	28.13	(6.05)	26.01	(5)	27.498	(4.75)	34.057	(3)	-3.05
SCVS[a]	--	--	--	-	12.777	(2.21)	23.288	(2)	-0.21[b]
Calculators	62.38	(13.43)	64.75	(11)	67.704	(11.70)	84.257	(9)	-4.43
	464.58	(100)	577.49	(100)	578.279	(100)	994.137	(100)	

a. Servo Controlled Voltage Stabilisers

b. Over 1981-82.

Source: Management Information Report on Sales for 1980-81, May 1981 (Annexure 3); for 1981-82. Ref.MPC/MIR/450 27.4.82 p.5; for 1982-83, Ref.MPC/MIR/027/83 27.7.83. Marketing, Planning & Co-ordination Group.

by the Corporation, television was the first project and the largest contributor to total sales value of direct projects at least until 1980-81. It is therefore logical to study Keltron's television operations in order to evaluate its subcontracting practice.

Section 2: Keltron's TV operations

The Corporation started TV operations in 1974 at Keltron Equipment Complex[21] (KEC) as a subcontractor to Electronics Corporation of India Ltd. (ECIL), a Hyderabad-based television manufacturer. ECIL provided designs and specificiations, the necessary knowhow, quality controlling and other guidance and then carried out final testing and marketing of the TV sets under its own trade mark ECTV. The Corporation (Keltron) could, according to the agreement, also sell ECTV sets through its distribution channels. Thus, the relationship between ECIL and Keltron's TV plant, hereafter referred to as KEC(TV), was one of commercial subcontracting.[22]

This agreement ended in 1978-79 and KEC(TV) began to assemble and sell television sets under its own brand name 'Keltron'. During the 5-year period between 1974-79,

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21. This Complex is situated at Karakulam, about 15-20k.m. away from downtown Trivandrum.

22. See Keltron, Annual Report 1974-75, p.6;Govt.of Kerala, Examination of the Working of KSEDC ....,op.cit.pp.1-4 for the set of terms and conditions of the collaboration between ECIL and KSEDC.

when about 7 ECTV models were brought out,[23] KEC (TV) also resubcontracted out certain less sophisticated intermediate items/operations. Thus, subcontracting prevailed right from the inception of the Corporation's TV operations.

Production and Sales Performance

Table 3.7 shows that the Corporation's TV sales grew at an average annual growth rate of 16 per cent (at current prices) over the period from 1974/75 to 1982/83[24]. It terms of number of TV sets, production increased at an average annual growth rate of 15 per cent between 1974/75-1982/83[25].

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23. Between 1974-79, the following ECTV models were assmbled: HW 301-20 inch single cone, HW 303-20 inch dual cone, HW 301-19 inch single cone, HW 303 A-20 inch dual cone, HW 321, DW 303 and DW 321. Source: Costs and Accounts Dept. at KEC(TV).

24. The published figures from Annual Reports are used to compute growth rates. But if we go by the Management Information Reports on Sales (for internal circulation only), we notice that the television sales in 1981-82(Rs.330.991 lakhs) registered a negative growth rate of - 12.5 per cent over the sales value in 1980-81 (Rs.366.755 lakhs). The marketing, Planning and Co-ordination Group also computes growth rates at the level of branch offices in different parts of the country. For example, the overall growth of consumer electronics for 1981/82 over the previous year was -1.7 per cent. At the disaggregated level, television sales showed negative percentage growth rates of -27.4 per cent in Madras branch, -17.6 per cent in Bombay branch, -35.2 per cent in Delhi and -7.2 per cent in Calcutta during 1981/82 over the previous year. In 1982-83, the growth rate of consumer electronics was positive but monochrome TV sales value showed negative growth of 21.2 per cent in Madras Branch and 28 percent in Bombay branch. See Management Information Report on Sales, Ref. MP/MIR/021/83, pp.9, 21.23.

25. If we take the figure of 12,843 sets as the production during 1982-83, according to KEC(TV)'s costs and A/cs. Dept., then the percentage growth of production during 1982/83 was negative by 24 per cent and the average annual growth rate over the period 1974/75-1982/83 comes down to 13.8 per cent.

Table 3.7. Keltron's TV Production and Sales

Year	Licenced/[a] Installed capacity	Actual production Qty:no. of sets	Gap between actual production on the capacity (%)	%ge growth of production (No.of Sets) over previous year	Value of production in (Rs)	%ge growth over previous year	T.V. Sales (No. of sets)	TV Sales value (Rs)	%ge growth over previous year
1973-74	5,000	7	-99.86	--	14,700	--	N.A.	N.A	--
1974-75	5,000	994	-80.12	--	20,27,760	--	N.A.	26,29,796	--
1975-76	5,000	3,368	-32.64	+239	68,70,720	+239	N.A.	91,49,459	+248
1976-77	5,000	4,059	-18.82	+21	90,71,865	+32	4014	92,72,088	+1.3
1977-78	5,000	5,033	+0.66	+24	1,12,48,755[b]	+24	4985	1,16,30,901	+25
1978-79	5,000	4,142	-17.16	-18	92,69,000	-18	N.A.	1,07,66,295	-7
1979-80	10,000	11,364	+13.64	+174	2,66,83,000	+188	9504	2,75,56,207	+156
1980-81	10,000	10,471	+4.71	-8	2,47,28,600	-7	N.A.	3,19,69,288	+16
1981-82	20,000	16,921	-15.40	+62	N.A[c]	N.A.	N.A.	3,65,04,756	+14
1982-83	20,000	15.666	-21.67	-7	N.A.	N.A.	17573	5,44,32,625	+49

Source: 1) Annual Reports 1974-75 to 1982-83.

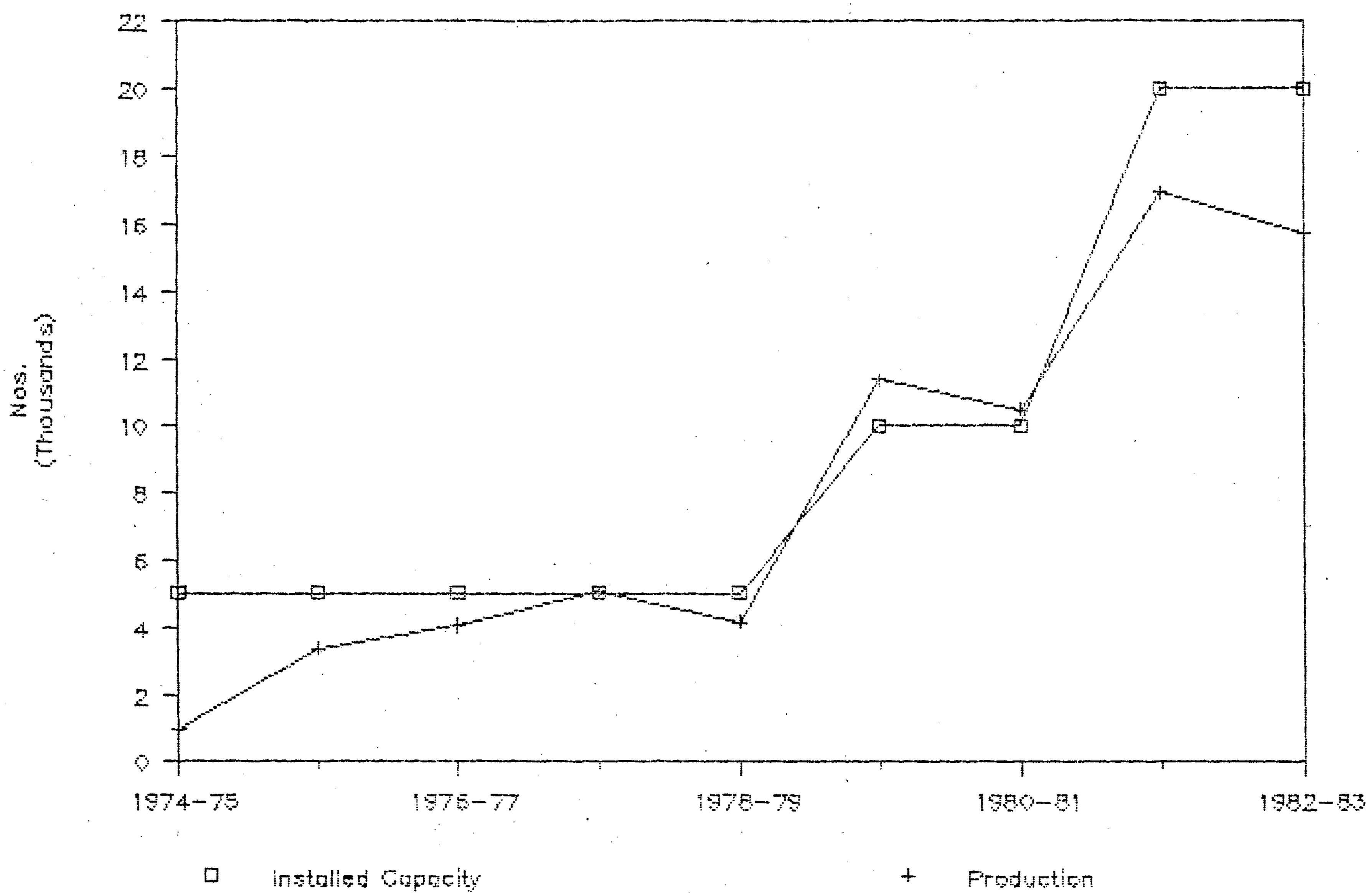
2) Value of Production figures from Costs & A/Cs Dept., KEC(TV)

a. Licenced and installed capacity are identical because "production on capacity of the plant mainly depends on man-power engaged and with the same installed capacity production can be varied employing more or less men". Annual Report 1981-82, p.62

b. The value of production for 1977-78, according to Annual Report 1977-78 is Rs.1,23,00,000.

c. not available

GRAPH1: Keltron's TV Production



In Graph 1, the yearly movements of the actual production of TV sets are charted out. It can be seen that with the exception of 1978 and 1980, the rest of the years experienced underutilisation of installed capacity at KEC (TV). The reasons for the fluctuations in production are not far to seek. The low production in 1974-75 was due to the acute shortage of picture-tube supply released by BEL or canalised through EITDC.[26] In 1975-76, it was due to " a slump in the demand for TV sets during the second half of the financial year" (April-March).[27] The upward movement during 1976-77 was due to rise in demand following the revision of the prices of 51 C.M. picture tube downwards and differential tax structure announced by the government which provided 15 per cent excise duty concession on the sets costing Rs.1800 or less. Keltron brought out two low-cost models to take advantage of this concession.[28] In 1977-78, the Corporation was given industrial license for expanding annual capacity up to 10,000 sets.[29]

However, production fell below the earlier capacity due to "the go-slow resorted to by the workmen

26. Govt.of Kerala, Examination of the Working of KSEDC...., op.cit.p.10; Keltron, Annual Report, 1974-75, p.6.

27. Govt.of Kerala, Examination.....op.cit.p.10(a); Keltron Annual Report 1975-76.

28. Annual Report 1976-77, p.4; Govt.of Kerala, Examination of.... op.cit.p.10(b).

29. Annual Report 1977-78, p.3.

followed by a strike in the Trivandrum units of Keltron group of companies for 46 days in September/October 1978 on the bonus issue."[30] During 1979-80 the Corporation launched "Keltron" TV sets and drew up an expansion plan "in the light of wide acceptance of TV sets in various centres outside Kerala and the proposed establishment of TV transmitting station in Kerala in the near future."[31] The production and sales in the year picked up remarkably over the previous year by 174 per cent and 156 per cent respectively.

But in 1980-81, production dipped because of (a) picture-tube shortage consequent upon the strike situation in BEL during the latter part of the year, and(b) "disturbed labour relations during the last quarter of the year" at KEC culminating in a total strike from March 3 to May 10 for a charter of demands including wage revisions and enhancement of welfare facilities. However, production began to rise after reaching an "amicable" labour-management agreement and settlement of strike in May 1981.[32]

30. The cumulative effect of this strike "had an adverse effect on the production and sales of the Corporation and its subsidiary/associate companies". See Annual Report 1979-80, p.3.

31. ibid.

32. Annual Report 1980-81, p.4. Actual production was only 60 per cent of the targeted production for 1980-81.

In the same year, the Corporation established a second TV factory at the Mudadi Panchayat near Quilandy in Calicut district so as to meet the "expected additional demand for the TV sets when the TV transmission station at Trivandrum is commissioned." This factory, mainly functioning as an assembly unit (i.e. without testing facilities), had an initial capacity to produce 500 TV sets per month and had an approved licensed capacity of 5000 sets per annum.[33]

Production during 1981-82 was adversely affected due to (a) loss of several mandays to reach normal production in the aftermath of the protracted strike during the early part of the year, and (b) slump in demand for black and white TV sets in the wake of official announcements regarding changing over to colour TV[34]. None-the-less, as the number of TV transmitters in the country doubled during 1982 with the setting up of 21 new LPTs, the Corporation drew up another plan for a third and fully equipped TV assembly unit at Manjeri in the backward

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33. See Keltron, Project Report for the Manufacture of Television Receivers at Manjeri in Malappuram District, (classified mimeo) 1983, p.2

34. Annual Report 1981-82, p.2

district of Malappuram in order to meet the anticipated increase in demand.[35]

The imperative for splitting up production capacity by setting up two additional plants stemmed from not only the anticipated increase in demand but, more importantly, from the compelling need to overcome the "problems of expansion" at KEC(TV). Also, there was an added advantage in establishing the Manjeri factory in that it was nearer and so easier to serve areas of market growth, namely, Bangalore, Coimbatore etc.[36]

The problems of expansion at KEC(TV) had been essentially (a) overstretching of infrastructural facilities available there,[37] (b) low labour productivity and (c) 'labour problem' and the concomitant procedural delays and work stoppages adversely affecting its production and

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35. See Keltron, Project Report for the Manufacture of Television...at Manjeri....,op.cit.p.7,10;19.The TV project at Manjeri was estimated to cost Rs.25 lakhs, with fixed capital accounting for Rs.15 lakhs and working capital for Rs.10 lakhs. Thus, the productive capital requirements of a TV plant with a capacity to produce 10,000 sets match or are well below the fixed capital upper limit fixed by the official definitions of small-scale and ancillary units. Hence the possibility of organised, bigger units or even smaller units offloading the whole production and testing to well-equipped small/ancillary units on subcontract.

36. ibid.

37. According to the top-management,"the infrastructure facilities at its TV manufacturing unit at Karakulam in Trivandrum had already been considerably stretched",the unit having already registered full utilization of its 10,000 sets capacity per annum and attained a production level of 15,000 sets per annum. ibid.p.2,4.

sales plans.[38]

The problems of lack of sufficient working capital and the problems in materials management together were said to have led to the problem of ensuring production inputs at KEC(TV). Added to this were the alleged managerial inefficiency and lack of incentives to the workers. While the average time taken by some other TV manufacturers to assemble a TV set was said to be around 4 hours, the average time taken at KEC(TV) had been 8-11 hours or even more.[39] That the manpower at KEC(TV) was underutilised was reflected in the considerable gap between the estimated time and actual time taken to assemble a TV set (see Table 3.7).

In the light of the Special Television Expansion Plan envisaged in 1983, the licensed capacity of the Corporation was increased from 20,000 to 40,000 sets per annum. The Corporation planned to phase out monochrome TV operations at KEC(TV) and shift them to the factories at Mudadi and Manjeri and to the radio unit KESL in order to take up colour TV(CTV) assembly and thereby take advantage of the shift in demand towards low-cost CTV sets.

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38. A top-management official divulged that it was Keltron's policy not to expand any more the directly recruited/unionised workforce at KEC and other main units so as to overcome the 'labour problem'.

39. Interviews with a few industrial engineers and with the personnel at the Costs & A/Cs Dept., at KEC(TV).

Table 3.7. Estimated Time and Actual Time Taken to make a TV set

	TV Model		
	TM 851	TM 951	TM 1050
TV sets produced	658	74	738
Labour Hours:			
Esti-mated	4441.50	370	3505.50
Actual	7543	628	5953
Labour Hours per Set:			
Estimated	6.75	5	4.75
Actual	11.5	8.5	8.1

Source: Material and Labour Analysis -- TV Production for the period from 1-7-1983 to 30-9-1983. Costs & A/cs Dept., KEC(TV)

Note: Similar data could not be obtained for other time points.

The Corporation also planned mass production of CTV sets at a separate factory elsewhere.[40]

It is evident from the above descriptive account that the availability of picture tubes and 'labour problem' on the supply side and growth of broadcasting infrastructure and consumer expectations on the demand side, governed fluctuations in TV production and sales of the Corporation. We shall proceed to discuss in some more detail Keltron's TV sales and marketing performance, especially vis-a-vis that of the competing brands in general.[41]

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40. See Keltron, Project Report.....Manjeri....op.cit.p.1; The 40,000 sets capacity was supposed to be split-up in terms of 20,000 sets manufacture at KEC(TV) and 10,000 sets each at Mudadi and Manjeri factories. See Annual Report 1981-82, p.5; Elsewhere it was pointed out that the total manufacturing capacity in 1983 was 46,000sets per annum: 36,000 at KEC(TV) and 10,000 at Mudadi. See K.P.P.Nambiar, op.cit.; It was also pointed out that production could be stepped up to 50,000 sets without additional approval. See Keltron News, March-April 1983, p.8; At the end of the survey, the Corporation planned assembly of 25,000 CTV sets at KEC(TV) and manufacture of 1,00,000 CTV sets at a new factory with equity participation from Gulf Malayalees and possibly with Taiwanese collaboration. See "Keltron plans Mass Production of CTV", Marketing Probe, GSD/MP/01/1984, (classified)Keltron.

41. This is an important component-task of the inquiry here as it would be later linked to the performance of ancillaries/subcontractors. The ensuing discussion is based on detailed interviews at the General Sales Division, Keltron.

Table 3.8 shows the various models of "Keltron" make TVs (belonging to monochrome as well as colour groups) that have been put in the market since 1979. The models differed more in terms of external features (e.g. cabinets, decorative items and additional facilities than in terms of the internal circuitry. Consider the TM 851/861 series. These TV models, based on ECIL design, had circuitry the same as that of ECIL sets but were different in terms of features.[42] Their circuit was proven because of modular construction,[43] which rendered the sets for easy maintenance. That is, it made after-sales servicing of complaints easier; defective modules could be replaced by new modules. These models became popular in the market because of their high quality and good performance. But the market for them soon became saturated because of their high cost due to high component count and cost. The demand for 851 series drastically fell and Keltron was left with big inventories.[44]

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42. The size of 861 model was bigger than that of the 851 models.

43. Modular construction referred to the arrangement of three printed circuit boards concerning picture, sound and power supply vertically one above another.

44. At the time of the survey, TM851 series were assembled in very small quantities. The most expensive model, TM 861 was being manufactured because of orders from certain State governments (eg. Gujarat government) and from Doordarshan for rural broadcasting. Since 861 had a bigger screen it was preferred to be used as community sets.

Table 3.8. 'KELTRON' TV MODELS

Model, Screen size, Picture Tube	Year of Introduction/ Marketing period	Average Basic Price (Rs)	Date
(1)	(2)	(3)	(4)
TM 851 51CM 20"	1979-83	2254	31-3-79 to 26-11-83
TM 851 S 51CM 20" (Secons with old cabins)	1979-80	1775	23-11-79 to 29-7-1980
TM851 D 51CM 20" (Deluxe)	1979-83	2449	31-3-79 to 26-11-83
TM851 DS 51CM 20" (Deluxe shutter)	1982-83	2565	6-1-82 to 26-11-83
TM 861 61CM 24"	1980-84	3004	11-10-80 to 26-11-83
TM 1851 51CM 20"	1981-82	1800	22-10-82
TM951 51CM 20" (Janatha)	1979-81, 1983	1808	30-4-79 to 21-1-81 13-10-83to 26-11-83
TM1050 51CM 20" (Economy)	1982-83	1837.5	18-8-82 to 26-11-83
TM1050S 51CM 20" (Shutter)	1983	1950	12-9-83 to 26-11-83
TM1251 51CM 20" (Color TV)	1982-83	4800	10-8-82 to 26-11-83
TM1251D 51CM 20" (Color TV)	1982-83	5185	19-11-82 to 26-11-83
TM 1151 51CM 20" (Economy Deluxe)	1983-84	1925	12-9-83 to 1-3-84
TM1151DS 51CM 20" (Economy Deluxe Shutter)	1983-84	2200	19-12-83 to 29-2-84

(contd....)

(1)		(2)	(3)	(4)
TM1451 51CM (Economy Deluxe)	20"	1983-84	2050	19-9-83 to 1-3-84
TM 1551 51CM (Lowcost color)	20"	1984	4500	2-2-84
TM 1135 (Portable)	14"	1983-84	1595[a]	28-10-83to 1-3-84
TM 003 51CM	20"	for resale	2250[b]	1-3-1984
New Portable TV	12"	to be brought out		
TM851-A 51CM	20"	1984	1750	1-3-1984
TM951-A 51CM	20"	1984	1800	1-3-1984

Note: 1) a & b: inclusive of excise duty

2) Basic price = Total works cost + Corporate overhead + margin

Source: Costs & Accounts Department, KEC(TV)

We had earlier stated that a distinct tendency to bring out low-cost TV sets began in Indian TV industry from 1980 onwards. In this context, Keltron introduced an apparently new model (TM 1851) during 1981-82. But this was actually the same as the old TM 851. It was introduced with the purpose of clearing the inventories of 851 model through 'spurious' price reduction.[45]

This was also the period (i.e. from 1980 through '81-82) when another public sector company, namely, UPTRON entered the market aggressively with very low-priced TV sets. Moreover, UPTRON adopted an aggressive sales strategy and appointed the same dealers working for Keltron to the detriment of the latter; Uptron-make sets began to outsell Keltron-make sets.[46]

Along with TM 851 series, Keltron also introduced the TM 951 Janatha model based on the design developed by its ER & DC. But this model was not well accepted in the market possibly due to servicing problems (eg. defect in sound system). However, this model, despite its unreliability,

45. The basic price was reduced to Rs.1800 so that the excise duty leviable became concessional(according to the government policy of a levy of 10.5 percent excise duty on basic price upto Rs.1800 and 26.25 percent on basic price greater than Rs.1800. The price reduction was spurious in that the earlier high basic price was realized by adding Rs.600 as second year service charges !

46. The 'cheapest' set from Keltron became the 'costliest' set at the dealers' shops, so to speak. It was the contention of some top-management officials of Keltron that the aggressive price competition from private manufacturers and even from a State unit such as Uptron had been at the cost of high quality and perceived performance of the TV sets.

was produced in small quantities up till the end of 1983. In 1982, Keltron brought out TM 1050 Economy model with a new circuitary based on its ER&DC design as a substitute for TM 951. But again this model did not sell in the market as it was a problem ridden model (eg.servicing problems and back-side of the set getting heatedup).

In 1983, TM 1050 S was put in the market as some branches requested for sets with shutters.[47] Since shutter-type cabinets pushed up the price of the TV set, the sets were first cleared from the factory with concessional excise, and then shutters available in rolled form were fixed at the branches. Both TM 1050 and TM 1050 S were discontinued slowly as they faced market-rejection. In 1983, their production and marketing was stopped.

On the eve of, and during ASIAD Games in 1982, Keltron assembled CTV sets out of the imported SKD kits canalised and distributed through ETTDC. The two models, CTM 1251 (based on SKD kit from the Samsung, South Korea, and with turret tuner) and CTM 1251 D (based on SKD pack from ITT, West Germany, and with electronic tuner) were sold at retail prices that were on a par with those of most

47. When asked why shutters made a difference in marketing, the reply from GSD was that they did not have any utility (not even protective utility because a shy at the screen with a cricket ball cannot break it) other than, say, consumers' preference not to make their servants watch the programmes. The preference could also have been due to the dust protective utility of the shutters.

other manufacturers.[48]

After ASIAD, a trend of low-priced sets with maximum additional facilities (or special features) set in the TV markets in the country.[49] In this milieu, Keltron too introduced in 1983 three "economy deluxe" models -- TM 1151, TM 1151 DS and TM 1451 -- with tape in, tape out and VCR facility.[50] These three models had the same circuitry but differed in terms of outside features.[51] They found market-acceptance unlike the earlier 951 and 1050 models. At the time of the survey, they were found to be Keltron's relatively better moving sets. Hence they were dominant in the product-mix, indicated to the factories by the marketing department.[52]

It was learnt that Keltron had been undertaking 'trading' in TV sets since around 1981. This practice was

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48. During 1982-83, Keltron assembled 768 numbers of CTM1251 and 1923 numbers of CTM 1251D sets, according to the Costs & A/Cs Dept.,KEC(TV). They were sold at about Rs.8800 and Rs.10,200 respectively. The CTM 1251 D model led to problems because the tuners went out of stock and Keltron had to design and manufacture them.

49. For instance, companies such as Bush,Crown,Uptron,ECIL introduced TV sets with such additionals as tape in,tape out,tape recording facility, video cassette recorder facility etc., plus built-in voltage stabiliser(to control fluctuations in far off rural/semi-urban areas) and light emitting diode(LED) display (i.e. light glows when the set is on)and so on.

50. The high-cost models--TM 851/861 series--had only one special feature, viz.tape recording facility.

51. TM 1151 did not have shutter whereas TM 1151 DS had plastic moulded front panel with shutter; TM 1451 had a wooden front panel.

52. TM 1451 was not marketed in Northern branches due to high transport costs involved, according to the management.

not exclusive to Keltron; other reputed firms practised it as well. TV sets were purchased from small units according to Keltron's design specifications and were resold under 'Keltron' label after quality controlling and testing. For example, the TV model 003 that had been introduced in Bombay and Delhi markets was actually purchased from a small manufacturer in Delhi.[53] At the end of the survey, Keltron planned to procure 1000 sets per month this way and adopt similar strategy in the markets of Calcutta, Bombay and elsewhere.

The sleek portable model TM 1135(with built-in telescopic antenna) that Keltron introduced in the market actually purchased for resale from Messrs.Calcom Electronics, which imported them from the Samsung, South Korea. These sets were quality controlled at Keltron's branch office in Delhi and were then sold through different branches in the country[54]. During the survey, Keltron planned to introduce a new portable TV model or mini-TV (with 12-inch diagonal picture tube) at a much cheaper sale price(of about Rs.1000).

53. This small unit, namely, Messrs Farikh Corporation, presumably had just two rooms with a turnover of Rs.2 crores. Apart from certain TV components, it also manufactured and supplied TV sets on subcontract to many TV manufacturers.

54. The only thing manufactured indigenously was the name plate bearing the brand and style, "Keltron"!

Such "trading" or commercial subcontracting on a large-scale was preferred to manufacturing in Kerala so as to raise the profitability of Keltron's TV operations through economies involved in terms of overhead, labour and transport costs, excise, local taxes etc. This point becomes clearer in the ensuing discussion.

During the second half of 1983 and early 1984, the market for black and white TV sets was found to be rather dull[55] as low-cost CTV sects (due to budget concessions) were expected to flood the markets. In early '84, Keltron introduced a low-cost CTV model (CTM 1551) following a heightening of competition between the manufacturers for the control of the market of economy models with special features.[56]

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55. However, the demand forecast, according to KEC(TV)keeping in view the anticipated rise in demand due to Special Expansion Plan and the (initial) shortage of low-power consuming 'mini-neck' picture tubes from Japan, was 4(monochrome): 1(colour) in terms of the number of potential customers for black and white and colour sets.

56. Keltron's color TV set was based on modified design of the TVs imported from ITT(West Germany) during ASIAD, picture tube and deflection components imported from Toshiba, Japan and electronic push button tuner imported from Preh, Germany. On Weston's and ECIL's economy models, see The Hindu, March 24,1984, p.5 and "51 cm CTV prices may down further", Indian Express, April 27,1984,p.9. The special features that the manufacturers devised were: built-in compatibility with VCRs(for the luxury of home movies), usable as a TV games monitor, and as a monitor for computers (home or institutions), cordless remote control (optional) facility for all functions, sliding control for all functions, electronic time constant correction (which facilitates absolute picture stability during play back), fully moulded ABS body, back and front to fit into the most modern cabinets, built-in-stabiliser, moulded frontage with rolling shutters, pickup and direct recording connections, double speakers, LED indicator etc.

In March 1984, Keltron introduced monochrome models, viz. TM 951-A and TM 851-A. These were not new. They had the circuitry of TM 1151 model and the cabinets of TM 951 and TM 851 models. In effect, Keltron had introduced them in order to clear the huge inventories of the cabinets of 851 and 951 models.

The offtake of Keltron's TV sets(manufactured in Kerala) in different markets of the country outside Trivandrum had often been low because of not only price competition but also non-price competition as revealed by a few market studies.[57]

57.These studies, undertaken by the Marketing Department of Keltron and on its behalf were based on sample surveys of dealers and/or consumers in different markets of the country. Their objectives were to get (a) an idea of the trend of TV sales in different markets,(b)to track down the position of Keltron's TVs vis-a-vis a large number of other brands,each with many models appealing to the consumers through its own projected features, selling points and attributes in terms of appearance, price,quality, advertisement support,after-sales servicing etc. and(c) the trade terms offered by different competitors in order to suggest alterations in Keltron's marketing strategy. They revealed that several competitors, unlike Keltron, provided the customers with attractive replacement facility(of parts or the whole set),credit facility (via hire-purchase system, especially in the form of a tie-up with a bank), higher price discounts in off-season, longer guarantee periods, better after-sales service etc; they also provided incentives to the dealers such as target bonuses (cash or quantity discounts on target basis), lower security deposits, liberal credit facility(instead of down cash payment condition), higher dealer margins, sponsored(foreign) trips, dealer associations and meetings, gala parties, gifts etc. However, from 1983 onwards Keltron too altered its marketing strategy by introducing attractive hire-purchase system, target bonus (that varies seasonally with the model and region), free corporate and support for the dealers plus ad support with dealer's name if the dealer agrees to a tie-up to share ad expenses equally, and so on. See Keltron,Market Survey Report on Television Receiver at Bombay, Calcutta and Delhi,CMD/MPC/007/82;Keltron, A study of Consumer and Dealer Attitudes on Television in Bangalore City, CMD/MPC/005/81 (classified)November 1981; Study Amongst Keltron TV Owners in Madras City, by F.D.Stewart Pvt.Ltd., July 1983;L.Unni-Krishnan, A Market Survey on Dealer Terms for Television in Madras City, BITS,Pitam; D.Parameswaran, Market Study on Television in Trivandrum on behalf of Keltron,Project Report, Dept.of Bus.Admn.,Annamalai Univ. Aug.1983;Plus interviews at GSD.

Keltron's TV cost-price structure and profitability

Table 3.9 shows the basic price[58] and customer price of different models in Trivandrum, according to the price lists made available at GSD, Keltron. The differential between the two prices expressed as a percentage share of the latter ranged from 26 to 45 per cent. At the time of the survey, the customer price was determined by adding a number of additional costs to the basic price. These included (a) octroi, freight, forwarding and insurance, (b) delivery charges, (c) sales tax, (d) excise duty and (e) dealer discount.[59] The excise duty imposed on "low-cost" models (TM 1851, 951, 1050, 851-A, 951A, 1151, 1451, etc) was less than that on the "high-cost" models (TM 851/861 series, 1251 and 1251D).[60] On examining the break-up of

58. The basic price, as mentioned before, consisted of total works cost plus corporate overhead plus margin. The total works cost in turn consisted of material cost plus material overhead plus direct labour cost plus overhead (financial charges and plant overhead) plus royalty paid to ER &DC of the Corporation for having designed the set. The list price referred to the basic price plus dealer discount/ margin.

59. Before August 1982, for TM 851 series and TM 1050, service charge, antenna and dealer discount on antenna were additionally included but later on Keltron stopped the restrictive trade practice of selling antenna and accessories under its label at disproportionately high prices.

60. According to a GSD file, TV sets "are classified as economy and deluxe models based on the basic price. Models priced below Rs.1800 are termed economy and the models priced above Rs.1800 are termed deluxe. The economy models attract an excise duty of 10.5% and the deluxe models attract an excise duty of 26.25%. In the case of 14 inch models, the models costing below Rs.1600 will attract 16.5% excise duty and models priced above Rs.1600 will attract excise duty of 26.25%. We noticed that 15% excise was levied on economy deluxe models such as 1151, 1151DS, 1451 and also on other such models as 951,1050,851-A & 951-A.

Table 3.9. Basic Price--Customer price differentials

TV Model TM	Date/period	Basic price (Rs)	Customer price at Trivandrum (Rs)	(4-3) as %age of (4)
(1)	(2)	(3)	(4)	(5
851	Before Aug.1982	2400	4326	45%
	Before Aug.1983	2140	3520	39%
	After Aug.1983	2240	3320	33%
851D	Before Aug.1982	2660	4340	39%
	Aug. 1983	2440	3550	32%
851DS	Before Aug.1983	2750	4002	31%
	Aug.1983	2540	3729	42%
861	Before Aug.1982	3200	5510	42%
	Before Aug.1983	2900	4666	38%
951	Aug. 1982	1800	2800	36%
1251	Aug.1982	4800	8270	42%
	Aug.1983	4800		
1251D	Before Aug.83	5185	9718	47%
	Aug.83	5185	8560	39%
1050	Before Aug.1982	1800	2718	34%
	Before Aug.1983	1800	2491	28%
	After Aug.1983	1875	2617	28%
1050S	Before Aug.1983	1950	2923	33%
1151	Aug.1983	2000	2826	30%
	March 1984	1900	2698	29%
1151DS	After Aug.83	2200	3082	29%
	Aug.83	2150	3018	29%
	March 1984	2050	2889	29%
1551	May 1984	4500[a]	7200	37.5%
1135	Before Aug 1982	1600	2346	32%
	August 1983	1680[b]	2280	26%
	March 1984	1510[b]	2090	28%
003	March 84	2200[c]	2995	27%
851-A	March 84	1750	2495	30%
951-A	March 84	1800	2559	30%

a. Basic price as given by costs & A/cs. Dept., KEC(TV)
b. Basic price inclusive of excise duty;
c. Basic price inclusive of excise duty; customer price in Bombay.

Source: General Sales Division, Keltron

customer price in different branches other than Trivandrum, it became clear that the variation in customer price between branches was due to differentials in (a) octroi, freight, forwarding and insurance, (b) sales tax and (c) delivery charges.

It was learnt that margins had been foregone on several TV models in the context of tight competition in the markets. Rather than allow inventories to pile up and incur inventory cost, TV sets had even been sold below cost.[61] Table 4.0 clearly shows that before August 1983, the basic price for TV models TM 851, 851-D, 951, 1050, 1050 S, 1251 D had been less than their total works cost, thereby resulting in negative margin or loss. Only on the 861 model a margin of 12 per cent was realized. The models 851-DS and 1251 realized meagre margins of 0.9 per cent and 1.6 per cent respectively. Even on the relatively better moving economy deluxe models, the margins were almost negligibly small. Table 4.1 shows that a positive margin of 3.6 per cent on 1151 during August '83 through February '84 had become negative from March '84 onwards. The margin realized on 1151 DS during the same period was 1 per cent and on model 1451 it was about 5 per cent which had come down to less than 1 per cent from March '84 onwards.

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61. Interviews with GSD personnel and at Costs and Accounts Dept., KEC(TV).

Table 4.0: Profit Margins on T.V.Sets

TV Model	Material cost (Rs)	Material overhead (3%)	Labour & overhead (financial charges 10% + Plant overhead (Rs)	Royalty (Rs)	Total works cost (5) = (1)+(2)+(3)+(4)	Basic price or Selling Price	Profit margin (6)-(5)÷(6) (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TM851	1,874.35	56.23	315.56		2246.14	2,140[a]	-4.95%
TM851-D	2,036.66	61.10	315.56		2413.32	2,325	-3.79%
TM851-DS	2,064.69	61.94	315.56		2442.19	2,465	+0.92%
TM861	2172.20	65.17	315.56		2552.13	2,900	+11.96%
TM951	1756.52	52.70	233.75	72.00	2114.97	1,800	-17.49%
TM 1050	1565.01	46.95	222.06	72.00	1906.02	1,800	- 5.89%
CTV1251	4404.00	132.12	187.00		4723.12	4,800	+ 1.58%
CTV1251-D	5,626.00	168.78	374.00		6168.78	5,185	-18.97%
TM1050S	1,565.01[a]	46.95	222.06	72.00	2021.02	1,950	- 3.64%

Source: Costs & A/cs. Dept., KEC, Karakulam Rates adopted for valuation of finished goods-TV 30-6-1983. Note: Labour, Plant overhead including financial charges per hour Rs.46.75

Note: a) Material cost became Rs.1680.02 on adding Rs.115 + 1% sales tax as cost of the rolling shutter.

Table 4.1 Profit margins on economy deluxe TV models

TV model	Total works cost (Rs)	Basic price or Selling price (Rs)	Date	Profit margin (2)-(1)÷(2) (%)
	(1)	(2)	(3)	(4)
TM 1151	1927.61	2000	Aug.83 to 29.2.1984	+3.6%
	N.A.	N.A.	March 1,'84	-1.45%
TM 1151DS	2177.16	2200	Aug.83 to 29.2.84	+1.04%
TM 1451	2037.51	2150	Aug.83 to 29.2.84	+5.23%
	N.A.	N.A.	March 1,84	+0.60%

Source: Costs & A/cs. Dept., KEC, Karakulam.

(N.A. = not available)

In sharp contrast to the above, the TV sets that were procured on "trading" basis, had higher margins. For example, the portable (14-inch) model, TM 1135, was purchased at about Rs.1265 for resale at a basic price of Rs.1600 before August 1982 so that the profit margin realized on each set was about 21 per cent; further, as on February 1,1984 the basic price inclusive of excise duty of the same model was Rs.1510. On excluding the excise of 10.5 per cent, the basic price was about Rs.1351 so that the margin realized per set worked out to be 6.36 per cent. Similarly, the 20-inch model 003 was procured at a price of about Rs.1650 for resale at a basic price (inclusive of excise) of Rs.2200 in Bombay. On reducing 15 per cent excise, the basic price turned out to be Rs.1870 so that the margin realized was about 12 percent.[62]

Low and unfavourable profit margins of Keltron's TV project (within Kerala) was said to be mainly due to relatively high internal labour charges, high overhead costs and high finance charges (interest payments). Keltron also suffered from high transport costs on account of its strong locational disadvantage. Most of the materials/components had to be sourced from far off suppliers, necessitating large inventories; there were additional freight costs (i.e. cost of transporting the finished product to distant markets apart from cost of sourcing the materials etc. outside Kerala), high insurance charges and damage costs (due to long-distance transport). The local taxes (sales tax) were also said to be high. Furthermore, Keltron did not enjoy opportunities which some of its competitors did of procuring items from other sources at lower rates;[63] the material and labour costs of local suppliers/

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62. These computations were based on the price lists made available at GSD, Keltron. The relevant excise duties were mentioned by the officials interviewed.

63. For example, the prices of TV cabinets in Delhi, Madras and Hyderabad were said to be considerably cheaper than in and around Trivandrum. The Delhi manufacturers procured cabinets from subcontractors at such rates that they enjoyed an economy of about Rs.80 to Rs.100 per cabinet vis-a-vis Keltron, according to the GSD officials interviewed.

subcontractors were higher than those of the suppliers/ subcontractors in Delhi and other States.[64]

It was in the context of the conditions described above that we must posit Keltron's make-buy policy and the strategy to expand its role in commercial subcontracting of TV sets.

Section 3: Keltron's make-buy policy with regard to TV operations

Keltron restructured its TV project operations by resorting to a higher degree of subcontracting -- industrial and commercial -- and technological change with a view to reduce cost/price and to increase the offtake of its TV sets in different markets in the country. A brief idea about its subcontracting can be gathered from an analysis of the "Bill of Materials" for each TV model.

On going through a few Bills of Materials for different monochrome TV models at the Ancillary Purchase and Development Section (AP & DS) at KEC(TV), it was

64. Added to these high costs were high dealers' discount and high price of antenna and accessories. The dealers' margin that Keltron offered initially was relatively lower but became on a par with other firms later on because dealers preferred only those firms which offered higher margins. Also, as mentioned earlier, the restrictive trade practice of supplying antenna and accessories under Keltron label pushed up the prices until 1981-82. Source: GSD, Keltron.

found that the degree of integration in TV manufacturing was low. This implied correspondingly a higher emphasis on "buy" in the Corporation's "make-buy" policy. The sources of supply of the various items that went into TV assembly at the time of the survey are presented in Table 4.2.[65]

It was also learnt that the indigenous content of Keltron black and white TV sets had grown over time to nearly 95 per cent of the total value of materials consumed in production,[66] as shown in Table 4.3. In terms of number, it was observed that with the exception of a few imported items (e.g. TV rectifiers and some times picture tubes), all the rest in the 'Bills of Materials' were indigenously procured.[67] Some items were sourced from within the Keltron group.[68] A large number of items,

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65. The value composition of the items in different models could not be obtained.

66. According to AP & DS, the import content of Keltron colour TV sets was said to be about 75 per cent. Excluding the picture tube, CTV import content came down to about 30 to 40 percent.

67. "Nearly all the rawmaterials/components are available in the country for the manufacture of TV receivers. Requirement of electronic components and sub-assemblies can be easily met from indigenous sources. Picture tubes, one of the most important parts of the TV receivers is manufactured in the country by Bharat Electronics Ltd. etc. Further ETTDC also arranges imported picture tubes for the benefit of TV manufacturers to meet the country's shortfalls, if any." See Keltron, Project Report....Manjeri...., op.cit.p.5

68. These were certain types of capacitors, diodes and transistors, printed circuit boards, transformers etc. For CTV, crystals are sourced from within.

Table 4.2. Bill of Materials for a monochrome TV Model

S.No.	Item (with specific dimension/parameter)	Source of Supply/Name of the supplier-Company
1.	Picture tube(Black & White	B.E.L. and/or imported from Philips,Samsung etc.
2.	Tuner (for selecting channels)	Chawla & Co., Delhi
3.	Deflection yoke	Suchitra & Co.Delhi/VVR
4.	L.O.T.	" "
5.	Potentiometers	M.R.Electronic Equipments Ltd., Madras
6.	Presets	
7.	Loud speaker	
8.	Viewhood	
9.	Fuse	
10.	Main chassis(for ECTV design only)	Pieco
11.	Tubular capacitors	
12.	Spark plug capacitors	Nippon
13.	Polyester capacitors	Pieco/Nippon
14.	Styroflex capacitors	Revathi
15.	Metal polyestor capacitors	
16.	Polypropeleyne capacitors	
17.	Certain coils	Shilpa/Jantronix/internal (previously)
18.	Linearity Coil	Suchitra/VVR
19.	Coil formers	Govel
20.	Connectors	E.I.D.Parry/Hyd.Concent-ronix
21.	Alluminium metalsheet	Mehta Metals
22.	Copper clad sheet	Bakelite
23.	Copper foils	Mehta Metals

(contd...p.214)

Table 4.2 (contd.)

S.No.	Item	Source
24.	Mechanical & pressed items(i.e.chips,fuses, eyelets,shield covers, fasteners like metal and wood screws, nuts, plain washers, spring washers)	Asha Bros/Kumar/Baland/ Greenfield/Meland/Amitronics/M.S.Patel/Prime Tools/ Mutual/Arul
25.	Clamps for transformer,choke,aerial fixing	Baland/Tools India
26.	Balun beed	Ferro
27.	Bakelite sheet	Bakelite Hylam
28.	Driver transformer for CTV	procured from Madras
29.	Disc capacitors	Keltron/BEL
30.	Electrolytic capacitors	Keltron/Pieco/Bush/Serson
31.	Resistors	Keltron
32.	Diodes/transistors (semiconductors)	Keltron/BEL/ECIL/Punjab...
33.	Power transistors	Keltron
34.	Ceramic Capacitors	Keltron
35.	Printed Circuit Boards	Keltron/Ahmedabad(previously)
36.	Main transformers/ chokes	Keltron
37.	Pat Core transformers	Keltron
38.	Switch mode power supply(SMPS) transformer	Keltron
39.	Crystals for CTV	Keltron
40.	TV-20 Rectifier	imported

Source: Ancillary Purchase & Development Section, KEC(TV)

Table 4.3 : Indigenous/import content of monochrome TV production

Value of Imported rawmaterials consumed in production during the year and %age of imported and indigenous materials consumed to total consumption (imported through collaborators) Rs.in lakhs

Year	Imported		Indigenous	
	Consumption	% on total consumption	Consumption	% on total consumption
1973-74	22,383	16%	1,16,330	84%
1974-75	2,56,656	13%	16,54,987	87%
1975-76	8,19,265	12.65%	56,52,780	87.35%
1976-77	4,49,173	6.58%	63,71,666	93.42%
1977-78	4,61,524	5.72%	76,06,461	94.28%
1978-79	3,80,000	5.38%	66,84,000	94.62%
1979-80	9,04,000	4.19%	2,06,53,000	95.81%
1980-81	4,59,000	2.19%	2,04,66,000	97.81%
1981-82	2064,000	5.79%	3,39,28,000	94.21%

Source: Keltron, Annual Reports, 1974-75, p.34; 1975-76, p.34; 1976-77, p.42; 1977-78, p.44; 1978-79; 1980-81, p.53; 1981-82.

accounting for roughly 80 per cent of total number of items required for black and white sets were procured from outside Kerala. These were generally 'standard' items being supplied to the TV industry as a whole.

Keltron did not internalise the production of the standard items because it would be very uneconomical for it to service the demand for its low volume of production. At the time of the survey, Keltron's actual scale of TV production was about 40-60 sets as against the targeted level of 100 sets per day at the KEC(TV) factory. At the second TV factory (at Mudadi Panchayat), only about 30 sets as against the targetted level of 60 sets per day were assembled. Further, components like picture tube, L.O.T. deflection yoke, turner, potentiometers were specialised items; these were relatively more technologically sophisticated items and their production required high capital investment. As such, it would have been uneconomical for Keltron to vertically integrate their production into its rather insignificant TV operations.

Some items and subassemblies (roughly accounting for 10 per cent of total procurement) were bought on subcontract (i.e. by placing "work orders" unlike "purchase orders" for standard items). The different items so procured are listed in Table 4.4.

Table 4.4: Subcontracted items for monochrome TV

S.No.	Item	Sub-item	Example
1.	Subassemblies	A) Assembly of wire bunches and harness (different types)	Assembly of a) main bunch harness (connecting different printed circuit boards), b) front panel bunch or panel control c) housing bunch, d) contrast bunch, e) power supply bunch, f) tuner bunch g) transformer bunch, h) yoke bunches (two different colors), i) aerial bunch for TM 851 model
		B) Printed circuit board Assembly (different types)	Assembly of a) main PCB, b) PSSR (power supply and sound receiver) board, c) I.F. (intermediate frequency) board, d) EHT (extra high tension) board, and e) SWEEP board for TM 851 model; Assembly of a) main PCB, b) audio PCB, c) regulator PCB and d) picture tube base for TM 951 model.
		C) Coil assemblies (different types)	
		D) Control mounting box and potentiometer assemblies	for TM 1151 and 1451 models.
2.	Electrical items	A) main transformers B) vertical chokes c) driver transformers	----

(contd....p 218)

Table 4.4 (contd.)

S.No.	Item	Sub-item	Example
3.	Mechanical, plastic and rubber items	PCB mounting bracket, heat sink, potentiometer knob, bush insulator, condenser clamps, capacitor clamps, P-clamps, special washers, spacers, guide channel, moulded power supply cord, plastic washers, bushers, transformer pads, spacer, rubber washers, bushers etc.	
4.	TV cabinet making	---	---
5.	Cartons and fitments	...	---

Source: Ancillary Purchase & Development Section, KEC(TV).

Note : For CTV, TV Cabinets, PCB assemblies, certain plastic and mechanical components were subcontracted.

Scale of industrial subcontracting

The extent of industrial subcontracting can be viewed in different ways. The information gathered from the Ancillary Purchase & Development Section at KEC revealed that the value of ancillary/subcontract supplies accounted for roughly 15 percent of total cost of production[69] of the TV project in

69. That is, total material cost plus total direct labour cost plus the value of ancillary/subcontract supplies, and other expenses.

1981. Alternatively, the extent of subcontracting can be measured in terms of the value of subcontract supplies as a percentage of the total works cost of a particular TV model.

Consider the three economy deluxe models, viz. TM 1151, 1151DS and 1451. For these models, TV cabinet, packing (carton and fitment), subassemblies and plastic and mechanical items were procured on subcontract. Table 4.5 showing the break-up of the cost of production of these models, gives us directly the value of cabinet and packing for these three models at Rs.324.83, Rs.538.85 and Rs.413.76 respectively. Table 4.5 does not, however, give us directly the value of subassemblies, plastic and mechanical items bought on subcontract. According to the TV Production Planning Dept. at KEC(TV), their average value per TV set at the time of the survey was Rs.34.50. By adding this to the value of cabinet and packing, we get an estimate of the total value of subcontracted items for the three models. As a proportion of the total works cost of the three models, it worked out to be 17 per cent (for TM 1151), 25 per cent (for TM 1151 DS) and 20 per cent (for TM 1451) respectively.

Yet another way, is to gauge subcontracting in terms of labour time and time-rate saving. According to the TV Engineering Development Group and AP & DS at KEC(TV), about 60 per cent of the total work content (or total time taken to do all the operations involved in making a TV set)

Table 4.5: Break up of cost of production of 3 monochrome TV models (in Rs.)

Item	TV Models					
	TM1151	Component cost as % of total workcost	TM1151DS	Component cost as % of total cost	TM1451	Component cost as % of total cost
Cabinet	252-18	13.06	466-20	21.40	341-11	16.74
Picture tube	415-60	21.56	415-60	19.09	415-60	20.40
Rear Panel Assembly	15-63	0.80	15-63	0.72	15-63	0.77
Potentiometer assembly A	15-31	0.78	15-31	0.70	15-31	0.75
Potentiometer assembly B	11-62	0.60	11-62	0.53	11-62	0.58
Loudspeaker	43-98	2.28	43-98	2.02	43-98	2.16
Tuner Assembly	103-71	5.38	103-71	4.76	103-71	5.09
Deflection yoke	44-75	2.32	44-75	2.06	44-75	2.20
Main PCB assembly	371-56	19.28	371-56	17.07	371-56	18.24
SMPS[a]	163-84	8.50	163-84	7.52	163-84	8.05
Picture tube base assembly	24-83	1.27	24-83	1.14	24-83	1.24
Other components	19-11	0.99	19-11	0.88	19-11	0.95
Shock Protection PCB	--	--	--	--	3-01	0.15
Packing	38-15	1.98	38-15	1.75	38-15	1.74
Total Material cost	1520-27	78.88	1733-99	79.64	1612-21	79.56
Material overhead(3% of total material cost)	45-60	2.37	52-02	2.39	48-36	2.37
Direct Labour Cost(5[b] hours)	29-00	1.51	29-00	1.33	29-00	1.44
Factory overhead[c]	100-75	5.24	100-75	4.62	100-75	4.95
Financial charges(10%)	151-99	7.89	173-40	7.96	161-19	7.94
Royalty(4%)	80-00	4.15	88-00	4.04	86-00	4.24
Total works cost	1927-61	100.00	2177-16	100.00	2037-51	100.00

a. Switch Mode Power Supply
b. Hourly labour rate = Rs.5-80; Labour cost over 5 hours = Rs.29-00
c. Hourly Factory Overhead rate = Rs.20-15; Overhead cost over 5 hours = Rs.100-75.

Source: Costs & A/cs. Dept., KEC(TV) February,1984.

was contributed by subcontractors / ancillaries. If 5 hours was the time required to do the final assembly and testing operations at the main units as indicated in Table 4.5, then 60 per cent of the total time partook by the subcontractors, worked out to be 7.5 hours.[70]

Thus, whatever way one examined the available data, the scale of subcontracting in Keltron's TV operations did not appear insignificant.

The rationale of industrial subcontracting

It may be interesting to note that some of the subcontracted items (such as wirebunches and harness, PCB assembly, transformers, chokes, coils and even TV cabinets) were, in fact, initially manufactured in-house at KEC(TV) for a short while.[71] According to the industrial engineers at KEC(TV), the total work content of a TV set was the sum of the elemental time units taken to do the various operations. These elemental time units, estimated through

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70. In sum, the total time taken to make a TV set was 12.5 hours.

71. The workers interviewed at KEC(TV) revealed that the top management had decided to subcontract out these items without the knowledge of the unions. Not only the unions but also the Purchase Department officials and Quality Control inspectors opposed subcontracting strategy with the argument that certain sections at KEC(TV) were overstaffed and underutilised and that some people were remaining idle. But this extensive opposition did not stall the management's move. However, as subcontracting of the previous in-house items increased, no worker was said to be retrenched at the main units. Instead, superfluous workers were shifted to other departments/ sections.

detailed time and motion studies, were the same for KEC(TV) and the subcontractors. In contrast, there was a marked variance in the hourly rates of labour and overheads. At the time of the survey, the hourly overhead rate at KEC(TV) was about Rs.20 and the hourly labour rate, about Rs.5-80 (as shown in Table 4.5). The hourly rate of overheads was considered to be lower at small units compared to KEC(TV)'s by about 50 per cent. The hourly labour rates were considered to be 2 to 3 times lower at the subcontractors than at KEC(TV). To put the calculus differently, subcontracting out was done on the assumption that for Rs.100 cost at KEC(TV), the equivalent cost at a small unit would be Rs.60 (including 5 to 10 per cent profit margin allowance). There was, thus a positive case for KEC(TV) to farm out labour intensive work among small-scale units on subcontract.[72]

Thus viewed, Keltron stood to gain from subcontracting by taking advantage of the differentials in the hourly overhead and labour rates between KEC(TV) and the small-scale suppliers. Yet, it was maintained by the management

72. It may be noted, en passant, that the parent unit called for quotations from small units after completing internal costing. The quotations were then compared with its assessment of the unit cost. This assessment, also called the bench mark, was however not disclosed to the suppliers. While the unit material cost was fixed uniformly for all suppliers, the unit labour cost varied between them. Hence the quotations when invited were basically intended to get the lowest bid for labour cost component. In the absence of comparative cost statements, we are not in a position to state the magnitudes of the differential in costs.

at the time of the survey that the rate per Keltron TV set vis-a-vis that of many competing brands was very high, thereby affecting Keltron's TV sales. As a result, it also transpired that the management chose to shift the main unit's operations to small sector for further cost-cutbacks. To appreciate better the rationale, a brief description of the stages of production at KEC(TV) would be useful.

The production operations at the main unit were basically divided into two stages: final (mechanical) assembly and final testing. Mechanical assembly operations (fitting and wiring) involved two phases. In the first phase different types of printed circuit boards assembled by the subcontractors were examined. Missing components were mounted and faulty soldering was checked and corrected. They were then tested. The second phase, called cabineting, involved fitting of various items, including those supplied by subcontractors, inside the TV cabinets. There was no assembly-line-type division of labour here. Once the mechanical assembly was completed, final testing of the TV sets was done. The sets assembled at the second factory (at Mudadi) were brought to KEC(TV) and tested.

At the beginning of the survey, it was pointed out that some big TV manufacturers had already subcontracted out even final assembly and testing operations to small-scale units. But Keltron could not do so for two reasons: first, these operations involved high-value items; secondly, Keltron was not sure of the expertise of the local small units to undertake such operations keeping in view its strict quality control standards.

However, by the time the survey was over, Keltron also planned to subcontract out final assembly and testing of monochrome as well as colour TV sets to the small sector. Keltron was to provide the small units with critical materials/components and technical assistance, procure the sets from them and market them under its label after putting them through quality control test.[73] Thus, we must understand Keltron's plans to rapidly expand its role in commercial subcontracting within Kerala as also outside Kerala, as an aggressive drive to rationalise costs, penetrate areas of market growth and realize higher profit margins.

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73. Around 18 small units, including a few TV cabinet subcontractors, had already acquired licenses from the Dept. of Electronics under the sponsorship of Keltron to manufacture monochrome and colour TV sets. Here we may note the misgivings of some production engineers and quality control inspectors of Keltron about the viability of such strategy. According to them, good quality black and white TV sets priced at about Rs.1500 could be manufactured by small units if only they paid their workers miserably low wages or they formed a consortium and introduced highly capital-intensive, semi-automatic processes of production to reduce costs and maintain high quality.

Apart from industrial and commercial subcontracting, there were two other important changes that had already set in at KEC(TV) for the Sake of low-cost rationalisation. The predominance of women workers at Keltron's TV plants(i.e. both at KEC and the second factory) reflected the managerial strategy of taking advantage of low 'unskilled' wages and and lower militancy of women. In the TV production section at KEC(TV), women constituted 70 per cent of the total work-force of 97(See Table 4.6). At the Mudadi factory 50 per cent of the 54 employees were women.[74]

The survey at the PCB testing division of KEC(TV) revealed that there were around 70 women employed, all categorised as 'unskilled' with an average pay of Rs.300 per month. Their qualification was SSLC. In the cabineting division, there were 10 men, all 'unskilled' with an average pay of Rs.600 per month. It thus appeared that 'unskilled' men were paid twice what 'unskilled' women were paid. This reflected the management's low-cost drive based on sexual discrimination. Also, more women were preferred because they were considered to be "less trouble-some". It also transpired that the management extended the training period of workers sufficiently long so as to derive maximum advantage by paying the trainee-workers less than

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74. Interview at KEC(TV) with a supervisor working at the Mudadi factory.

Table 4.6 TV Employment at KEC(TV)

Section	Total strength	Male	Female	WORKERS							
				Senior operator	Operator I	Operator II	Operator III	Senior Helper	Helper I	Helper II	Mazdoor
TV Production	97	29	68	12	33	36	7	-	1	8	-
TV inspection	13	9	4	3	4	3	2	-	-	-	1
TV Quality control	14	7	7	9	3	1	-	-	-	-	-
TV Engineering Development Group	4	3	1	1	1	2	Draughtsmen - 1				
	128			SUPERVISORS							
				Senior Supervisor			Supervisor I		Supervisor II		
TV production	2	1	1	-			2		-		
TV inspection/ Quality control	1	1	-	1			-		-		
TV Engineering Devt.group	2	1	1	-			2		-		
	5			EXECUTIVES							
				Asst.Manager production	Asst. Engr.	Deputy Engr.		Deputy Manager	Project Engr.IV	Engineer	Engineer Trainee
TV production	2	1	1	1	1	-		-	-	-	-
TV inspection	2	1	1	-	-	2		-	-	-	-
TV Quality control	2	1	1	-	1	-		1	-	-	-
TV Engg.Devpt. Group	5	4	1	-	-	1		-	1	1	2

Source: Personnel Department, KEC, Karakulam , March, 1984.

Note : As on 31-10-1983, there were also 98 employees (executives/supervisors, workmen and apprentices) at TV Purchase, Central Stores and Accounts Departments. Source: Costs & A/Cs.Dept. KEC(TV).

the standard wages.[75] All these methods were intended to reduce the cost/prices of TV sets.

Also, technological change was introduced to achieve cost cutbacks. For instance, models designed by Keltron were made simpler and thereby not only the component count was reduced but also certain components were replaced by others leading to cost reduction. Thus, the number of printed circuit boards was reduced from 5 in high-cost 851 series to 3 in low-cost models(TM 1050, 1151, 1451). Similarly, the low-cost models did not require main chassis, main transformers and vertical chokes; the main transformer was replaced by switch mode power supply (SMPS)[76] and potcore transformers leading to fall in cost. Certain mechanical items were replaced by fewer and cheaper plastic items.[77] The plastic component

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75. The workers in PCB testing, cabineting and final testing divisions admitted that the training period was one year though the necessary skills for doing the job could be learnt in just two weeks time. We may note here that in the final (TV) testing division there were 20 to 30 electrical workers with ITI qualification. Fifty percent of them were women. The ITI-qualified workers received an average payment of Rs.1000 per month after putting in 5 years of service.

76. SMPS is a sophisticated form of power supply; it regulates different voltages for operating different circuits. In the process, fluctuations are taken care of. It is used in both monochrome and colour TV models.

77. According to the TV Engineering Development Group at KEC(TV), costs came down from Rs.60 in TM 851 series to Rs.30 in low-cost/economy deluxe models due to low mechanical component count and replacement of some mechanical items by fewer plastic components.

count itself was reduced in monochrome models.[78] More importantly, the use of integrated circuits (ICs)[79] reduced both material cost and labour cost. ICs decreased the number of components. The trend was towards reduction in the number of ICs themselves with each IC becoming more and more complex (i.e. densely integrated). The models 1151, 1451 had two ICs and the colour TV model 1551 had six ICs.[80]

Further, certain components like TV coils, which were hitherto subcontracted to local units, were procured from medium and large-scale companies outside Kerala at rates cheaper than that of the local units. And TV coils themselves were expected to be replaced by ceramic devices in future designing of TV sets leading to further cost reduction.

Cost of production started reducing due to technological change on the above lines. But in this process, work-load on subcontractors was affected (negatively).

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78. The colour TV did not require hand moulded plastic components at all.
79. As has been pointed out earlier, the evolution of the structure of design has been from valve type to hybrid type to solid state type. The valve type design has no semiconductor devices but has vaccuum tubes. Its power consumption was the highest and in that sense it was less efficient. The hybrid design has a mix of discrete semiconductor devices and vaccuum tubes apart from picture tube. Its power consumption too was higher. The solid state design is based on semiconductors and ICs. In this design, the circuitry is simpler, big components are not required and power consumption is low and in that sense it is more efficient.
80. Colour TV circuitry uses many ICs in various stages like colour processing, decoding, vertical deflection, horizontal section, vision IF, sound IF, audio etc., to make it more compact and to reduce its failure rate.

To sum up, the TV operations of the Kerala State Electronics Development Corporation were initially subsumed under commercial subcontracting arrangements by ECIL. From 1979 onwards the Corporation became an independent producer and seller under its popular label, 'Keltron'. However, more often its production could not hit target levels due to the supply and demand constraints pointed out earlier, it experienced profit pressure and low offtake of its TV sets in the markets due to stiff price and non-price competition. In order to overcome these problems, the Corporation restructured its operations in a number of ways. It diversified its production towards CTV assembly. It embarked on low-cost rationalisation via technological change and predominance of women workforce in monochrome TV production. Apart from industrial subcontracting (which has been adopted right from the beginning) to take advantage of differentials in hourly labour and overhead rates, it began to aggressively embark on commercial subcontracting. This seemed to have improved the profitability and market penetration of the Corporation.

How this set of changes could have affected its industrial subcontracting relationship with local ancillaries/subcontractors is pursued in the next chapter based on the survey of 28 small scale suppliers.

CHAPTER 4

KEC(TV)'s SUBCONTRACT-SUPPLIERS

Introduction

This chapter seeks to examine the character of the relationship of subcontractors with KEC(TV) as also the factors governing the commercial viability of the sub-contractors. The analysis is based on an indepth study of 28 small-scale industrial units in and around Trivandrum which had subcontracting relationship with KEC(TV). The chapter is organised in three sections. Section 1 gives a profile of the 28 small units that were surveyed. Section 2 deals with issues and problems of subcontracting relations that have bearing on the viability of the subcontracting-in-firms. Section 3 describes the parent firm's version of the subcontracting relationship. This is followed by an overview of the subcontracting relationship between KEC(TV) and the sample units.

Section 1: Profile of sample units

As underlined earlier, industrial subcontracting has been integral to Keltron's TV operations. Interestingly, from the inception of TV operations at KEC(TV) and until the time of the survey, in all around 110 small units were reported to have worked as subcontractors. On the basis of the information from the Ancillary Purchase & Development Section (AP & DS) at KEC(TV), there existed 45 small units which had subcontracting connection with KECT(TV) at the time of the survey[1]. It may also be noted that 6 units of the sample had already closed down and 2 units went under during the span of the survey. Thus the entry and exit of small units working on subcontract to KEC(TV) seemed to be in a state of flux, suggesting thereby the instability of

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1. Similarly, a supervisory staff member of the second TV factory had revealed that there were only 3 "mahila samajams" (women's societies) doing subassembly work on subcontract as against the AP & DS personnel's claim that there were 12 small-scale ancillary suppliers. It may be noted here that the third TV factory (at Manjeri) which had not yet come into stream was expected to develop many ancillaries. The project report said : "Many of the sub-assembly and fabricated items can be subcontracted to ancillary industries. It is expected that ancillaries can be developed for the supply of TV cabinets, TV clamps, fabricated parts, rubber and plastic parts, PCBs, transformers and coils, assembled boards, wirebunches and packaging items. We propose to get most the printed circuit board assembly work through women's cooperatives. Unemployed women of the locality will be asked to form cooperative, work societies. They will be given training in the assembly work by the factory." See Keltron, Project Report.....Manjeri....., op.cit. p.5. Apart from ancillary development, the unit was expected to generate a direct employment of 33 to 48 people over the first 4 years of its operation.

of subcontracting relationship[2].

Product-group and location of subcontracting units

Table 4.6 shows that out of 45 subcontractors/ancillaries classed according to their manufacturing/assembly operations, 28 units were located in Trivandrum city and its suburban areas, 12 units were located outside Trivandrum but within the State and the remaining 5 units outside the State. All the 28 units (i.e. 62 per cent of the total) situated in and around Trivandrum were identified and surveyed.

Age of sample units

The average age (since the date of registration as small-scale unit[3] or commencement of first operation) of the 28 units was 5 years and there were 5 units as old as 5 years, 13 units older than 5 years and 10 units younger than 5 years.

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2. However, after the survey, it was found from AP & DS that two units which had closed down earlier, commenced their operations again; 10 units had started just then supplying items to KEC(TV) out of which 6 units were situated in Trivandrum, 3 units outside Trivandrum and within Kerala and 1 unit outside the State. The net increase in the number of subcontractors could be related to the pick-up in KEC(TV)'s production in the light of Special TV Plan.

3. Registration with Small Scale Industries Board or Small Industries Development Corporation (SIDCO) or Department of Small Scale Industries, Government of Kerala, or District Industries Centre or Directorate of Industries, Govt.of Kerala.

Table 4.6 Number of subcontractors/ancillaries : product-groupwise and locationwise

S.No.	Item procured for TV	In Trivandrum(a)	Outside Trivandrum and within Kerala(b)	Outside Kerala(c)	Total
1.	Subassembly operations[d]	7	1	-	8
2.	Electrical[e]	4	3	1	8
3.	Mechanical[f]	2	1	-	3
4.	Plastic[g]	8	-	1	9
5.	Cartons & fitments[h]	1	5	1	7
6.	Cabinets and packingwood[i]	6	2	1	9
7.	Paper rolls[j]	-	-	1	1
Total		28	12	5	45

Note (a): Different places of the city such as Manacaud, Karamana, Thampanoor, YMCA Road, Dharmalayam Road, Vazhuthacaud Junction, Kowdiar, Jagathy,
M Medical School Unction, Valiasala, Observatory Line, Kumarapuram Jn(Medical College PO), Veli Industrial Development Area, Kochuveli, Kunnukuzhy Poojapura etc., and the suburban areas such as Peroorkada, Karakulam, Nedumangadu, Attingal etc.

(b) Kottayam, Angamaly, Quilon district, Alleppey district, Cochin-Ernakulam district, Palghat district etc.

(c) Bangalore, Hyderabad-Secunderabad, Madras, Bombay, Delhi etc.

(d) These included assembly of wirebunches and harness, assembly of components on printed circuit boards, winding and supply of TV coils etc.

(e) These included main transformers, vertical chokes and driver transformers.

(contd..)

(Note to Table 4.6 contd.)

(f) These are picture tube brackets, back-cover fixing clamps, back-cover fixing plate, back-cover fixing bracket, special washers, mechanical (pressed) components for TV cabin manufacturing etc.

(g) These included mains cord or moulded power supply cord, 'P' clamps, condenser clamps, handles, lock and key, foot, bushers, washers, plastic transformer pad, spacers, capacitor clamps etc.

(h) These are also known as packaging.

(i) or just known as TV cabinets

(j) These are two-inch width gummed paper rolls made out of craft paper with the brand and style "Keltron" inscribed on them; they are used in packing TV sets.

Type of business organisation

Table 4.7 shows five types of business organisation of the 28 units. A majority of them (79 per cent) was constituted as single-proprietorship.

Table 4.7 Types of business organisation of sample units

S.No.	Type of ownership	No.of units
1.	Single-proprietorship	22
2.	Partnership	2
3.	Co-operative society	2
4.	Private Ltd. Co.	1
5.	Charitable Organization[(a)]	1
Total		28

Note (a) : This is Cheshire Home for the disabled and incontinent ; it has around 17 branches in the country; it depends on public charity contributions; it undertook subassembly work for KEC(TV).

Background of the subcontractors

Twenty one units constituted as single-ownership and one partnership unit had proprietors (or proprietors assisted by members of family or relatives) with formal/ informal technical background and/or business/managerial/ work experience before setting up their present subcontract business. One of the co-operative societies (making plastic items) was formed by unemployed technicians and engineers and the other, a women's co-operative (doing subassembly work), had a few members with technical (ITI) training.

Nature of workplace

The subcontract work was organised in residential buildings or separately in workshops. In most cases, the workplace took the form of workshop (see Table 4.8). It is possible to organise on a very small-scale basis certain hand-based subassembly operations, plastic component making on the basis of hand-moulding and transformer making in residences. But the predominance of workshop form in cabinet-making, mechanical component making, packaging-manufacture, plastic component making on the basis of injection-moulding and in other itemgroups could be clearly related to considerations like bigger scale of operations and/or larger storage of materials/finished products, machinery and equipment installation, number of tools and accessories, noise and dust pollution etc.

Table 4.8 Nature of Workplace of the Sample Units

Work place type	Product groups						Total (No.)
	Sub-Assembly	electrical	mechani-cal	Plastic	Packag-ing	Cabinet	
Residential	4	1	-	1	-	-	6
Workshop	2	3	2	7	1	6	21
Other[a]	1	-	-	-	-	-	1
Total(No.)	7	4	2	8	1	6	28

a. This was Cheshire Home - a big building.

Financing of enterprises

There were three ways of financing the productive capital (i.e. fixed capital and working capital) requirements -- own funding, loan funding and a mix of both. More than one half of the sample units depended on a mix of own and borrowed funds. There was no special association between the type of product/operation and source of financing.

Table 4.9 Source of financing

Source	Product groups: Subassembly	electrical	mechanical	Plastic	packaging	Cabinet	Total (No.of units)
1. Personal savings	4	1	-	2	-	-	7 (27)
2. Borrowed funds[a]	-	-	1	2	-	1	4 (15)
3. (1) plus (2)	1	3	1	4	1	5	15 (58)
							26 (100)

Note: a. Borrowings from friends and relatives, banks and/or official sources such as the government, SIDCO, Kerala, Finance Corporation etc.

b. This information could not be obtained from two units.

c. Parenthetic figures indicate vertical percentages.

Size of sample units

Majority of the units was very tiny in terms of not only the number of persons employed but also the value of fixed capital (see Table 5.0). Interestingly, there were 13 units which did not come under the Factory Act.

Table 5.0. Size-distribution of Sample Units

No.of employees size-class	No.of units	No.of emplo- yees	Fixed capital size-class (in Rs. thousands)	No.of units
2 - 5	9	36	0 - 2	3
6 - 9	4	29	2 - 10	2
10-19	8	100	10- 25	6
20-49	5	140	25 - 50	7
50 - 100	2	111	50 - 100	2
-	-	-	100 - 1000	7
-	-	-	1000 & above	1
Total	28	416		28

Note 1. The range of employees of the 28 units stretched from the lowest number 2 to the highest number 50.

2. The fixed capital value of the 28 units ranged from zero to Rs.20 lakhs. The units which reported nil fixed capital, belonged to the subassembly group and did assembly of wirebunches and harness or hand winding of TV coils.

3. The fixed capital value is strictly not comparable because some units gave the initial purchase value or the purchase value at the time of the survey; some gave the value of machinery, tools and accessories and some included the value of land and building with or without considering the appreciation in their value over time.

They employed less than 10 persons and used power. And the fixed capital value of all the units was far below the upper size limit of Rs.25 lakhs for a small-scale unit during the time of the survey.

In sum, we may roughly say that the typical subcontractor working for KEC(TV) was a single-proprietor who had some technical knowledge and employed around 15 persons (average number of persons employed by the 28 units) and invested about Rs.1.5 lakhs (average value of the 28 units) towards fixed capital.

Having noted the profile of the subcontractors, we proceed to discuss issues and problems concerning their subcontracting relations with KEC (TV).

Section 2: Issues and problems affecting commercial viability of the sample units.

To begin with, we consider the relationship of age with unit size (in terms of fixed capital) and extent of (source) diversification[4]. According to Table 5.1, there is

4. Extent of diversification is defined here roughly as the number of customers other than KEC(TV) for the same item or different items manufactured/assembled by a subcontractor.

Table 5.1. Age, Size and diversification: Interrelationship

Age group (class, years)	No. of units	Average age (years)	Average size (fixed capital value in Rs)	Average extent of diversification
0 - 3	10	2.05	28,750	1.2
4 - 6	10	4.90	47,750	1.3
7 - 9	5	8.60	2,98,000	3.4
10 - 12	3	10.33	7,55,000	4.66
	28			

a tendency towards interrelationship between the age (years), size (fixed capital) and the average extent of diversification of the units. Such interrelationship is also corroborated by a different way. The sample units are ranked (from lowest to highest) with respect to the three characteristics viz. age, size (fixed capital) and extent of diversification (see Table 1, Appendix 2). The objective is to find rank correlation (as a measure of the degree of monotonicity between the ranked characteristics) by employing Spearman's Correlation Coefficient('R')[5] to test hypotheses of "no association "

5. This is computed according to the formula $'R' = 1 - \frac{6 \; d_i^2}{n^3 - n}$ where 'd' is the differential between ranks assigned to characteristics of two populations and 'n' is sample size. This formula applies where there are no tied observations. There are many ties in our observations as can be seen from Table 1 in Appendix 2. But we have used the above formula by obtaining the ranks for tied observations by way of averaging the ranks that the tied observations would occupy as pointed out by Mendenhall and Reinmuth, Statistics for Management and Economics, 2nd edition 1974, pp.499-500.

between the two populations with similar characteristics as of the 28 units (considered as a random sample).

Table 5.2 shows whether 'R' for different sets of characteristics is statistically significant or insignificant against different critical value percentages on 28 degrees of freedom. We notice a strong association between the age and size (fixed capital) of the units as indicated by 'R' = 0.59 at 0.5 per cent critical value . Similarly, unit size (fixed capital) and extent of diversification of the units are also strongly associated as indicated by 'R' = 0.57 at 0.5 per cent level of significance. Age and extent of diversification are associated, albeit not strongly, as shown by 'R' = 0.37 at 5 per cent significance level.

Table 5.2. Some sample unit characteristics and Spearman Rank Correlation Coefficient 'R'

Characteristics	'R'value	at critical value
Age(years) Size(fixed capital)	0.5959	0.5%
Age Extent of diversification	0.3732	5%
Size Extent of diversification	0.5739	0.5%

Critical values of 'R'

n = Degrees of freedom	Level of Significance 5%	2.5%	1%	0.5%
28	0.317	0.377	0.448	0.496

Source: Mendenhell & Rienmuth, op.cit (Appendix, Table 11) p.544.

From the above findings, we may say that age is a proxy for the survival of the subcontracting units. That is, the older the firms the larger their capital base, and therefore, the greater the chances for such units of getting workorders from multiple sources. Larger fixed capital base opens up more diversification possibilities for them than for the under-capitalized units. The higher fixed capital seems to reflect the financial strength of their owners in terms of not only their personal savings, but also their capacity to borrow against their fixed assets. Also, we may say that the older the units, the longer their experience in specific operations. Such units have greater chances to get work from more than one source which in turn leads to expansion of their capital base so as to undertake higher volume of work.

Apart from age, size (fixed capital) and extent of diversification there are various other factors that could determine economic viability of the subcontractors such as workorder support, multiple sources of supply and market size, unit price fixation procedure and profit margins, quality control and rejection rates, technical assistance, terms of contract (regarding payment etc). input costs, technological change, wages, payment systems and labour cost adjustment, type of product/operation and diversification possibilities etc. What follows is an account of the experience of the sample units in relation to these and other factors. This account, albeit descriptive, gives us a concrete flavour of the subcontracting relationship between KEC(TV) and the sample units.

Work-order-flow

Almost all the units reported that they received work orders from KEC(TV) on short-term basis, usually on monthly or weekly basis[6]. The quantum of work received varied as also the number of daysof work in a month and number of months of work in a year. The work orders from KEC(TV) specified the item, quantity required, rates fixed by KEC(TV) delivery schedule (usually on monthly basis) and terms of payment.

None of the sample units could give data regarding work-order-flow from KEC(TV) or the value of work done by the unit over time on monthly basis. However, the qualitative statements gathered from them indicated that a majority of of the units faced the problems of instability and uncertainity of work orders from the parent unit (see Table 5.3). One subassembly unit, one plastic unit and 3 cabinet makers considered this as a major reason for their closure. Even

6. Only one unit, making cartons and fitments, reported that it got work orders from KEC(TV) on yearly basis.

most of the units which claimed themselves to be the largest suppliers were not satisfied with work order situation at the time of the survey (see Table 5.4)

Table 5.3 Work-order-flow to the Sample units

Work-order-flow unit's response	No.of sample units item-wise						Total
	Sub-assembly	Electri-cal	Plastic	Mechani-cal	Packag-ing	Cabinet	
Regular	-	-	1	-	1	-	2
Regular but Declining/ Small volume	2	2	1	1	-	1	7
Regular but stopped for the last few months	1	-	2	-	-	-	3
Irregular and small volume*	1	1	2	-	-	3	7
Irregular/small volume & completely stopped	3	1	1	-	-	1	6
Stopped for a long time	-	-	1	1	-	1	3
							28

* One Subassembly unit, one plastic unit and 3 cabinet makers considered this as a major reason for their closure.

Table 5.4 Work-order-flow to largest suppliers

Item - Group	Units' share in KEC(TV)'s total purchase (approx.)	Work-order-flow
1. Sub-Assembly		
(a) wire bunches & harness	80%	Regular but declining/small volume
(b) PCB Assembly	50-60%	Irregular/Small Vol./Stopped (Post 1980 phase)
(c) TV Coils	50%	Stopped for the last 3 to 4 months.
2. Electrical		
(a) Main trans-former	50%	Stopped for the last few months
(b) Driver trans-former	75%	More or less regular/small vol.
3. Plastic		
(a) Mains cord	60%	More or less regular but declining/Small vol.
(b) Washers, Bushers, clamps, pads etc.	50%	Regular but slowing down
4. Mechanical	60%	More or less regular but slowing down/small vol.
5. Packaging	80%	Regular
6. TV cabinets	50-60%	Regular but very low vol.

In the above milieu, a very useful way of gauging the viability of the units is to examine the month-by-month movement of the ratio of value of overheads (such as rent, interest on borrowings from banks and official sources, 10 per cent interest (opportunity cost) on personal savings, payments to some skilled/'control' workers etc) to value of work orders. As data on value of work orders over time could not be obtained, we cannot check how the ratio varies across different items and across different subcontractors. Intuitively, the ratio seemed to be unfavourable to a number of the sample units.

Multi-sourcing, competition and market-size

Almost all the sample units considered KEC(TV)'s strategy of multi-sourcing for each product/operation as unfavourable. They felt that the parent unit adopted this strategy with a view to (a) generate strong competition between the subcontractors for lowest (sealed) quotation, (b) have flexibility in ensuring timely supplies so that continuity in production at the main unit was not disrupted; and (c) facilitate switching work orders off from one subcontracting unit to another to take advantage of unit price differential etc.

It was maintained by the units that as the number of suppliers receiving orders from KEC(TV) increased for the same total volume of work (or for a total volume that did not increase considerably or for a volume which itself was low and declining), the quantum of work received by each unit got fragmented into smaller volumes thereby making each unit's operations uneconomical and non-viable. KEC(TV)'s quest for lowest bid via cut-throat competition between subcontractors on the one hand and fragmentation of total work between many units led eventually to the loss and closure of many subcontracting units[7].

According to the largest supplier of mechanical components, diseconomies increased because there was neither specialisation of subcontractors in regard to each specific item not an optimum scale of production. As regards work orders getting switched off, the secretary of a subassembly unit (women's co-operative) said the unit had been negotiating with KEC(TV) for price increases but KEC(TV) had not revised the rates as another unit (the charitable organisation) accepted work at whatever rates that were determined by KEC(TV). A plastic unit pointed out that KEC(TV) switched off orders to other units even if there existed a slight price differential.

Unequal bargaining power and low profit margins

A majority of the sample units considered the rates fixed by KEC (TV) through competitive bidding "unfavourable"

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7. One cabinet maker alleged at the time of interviewing him that there were then only 30 to 40 surviving small units which supplied to KEC(TV) and that as many as 80 to 100 ancillaries had already wound up their businesses due to non-viability and squeezure by the main unit.

vis-a-vis the costs they incurred and the scales of production at which they operated. The subcontractors had no role in the fixation of the unit prices; unequal bargaining strength manifested clearly at the time of negotiations to get new work orders; there was pressure from KEC(TV) to reduce the unit price quotation.

It must be stated that most of the subcontracting units could not give in detail their unit costs and prices (with break-ups). They only mentioned in passing the then current unit prices of some items/operations. For example, the range of labour conversion charges as pointed out by the subassembly units is shown in Table 5.5.

Table 5.5. Labor conversion charges fixed by KEC(TV) for subassembly operations at the time of the survey

Operation	Labor conversion charges Range(in Rs)
(1) Assembly of Wire bunches and harness (various types)	Re 0.20 - Re.1
(2) Assembly of components on Printed Circuit Boards (different types for different models)	Re.0.25 - Rs.8.50
(3) Winding of TV coils (various types)	Re.0.12 - Re.0.25

The unit prices and costs of certain items made by the four electrical units, the largest mechanical component suppliers and the largest packaging suppliers are shown in Table 5.6.

Table 5.6. Unit prices/Costs of Selected Sample Units

Item	Unit Price (Rs)	Unit Cost (Rs)	Profit - margin
1. Main transformer	97	90[a]	7%
2. Driver transformer (as given by two units)	(i) 5-10	4-50[b]	12%
	(ii) 5-15	4-40[c]	15%
3. Vertical chokes	38	35	8%
4. Picture tube brackets	1-40	1-30	7%

Note: (a) Break-up: Material cost (Rs.57.50) plus overheads (Rs.20) plus labor cost (Rs.12-50);

Break-up of material cost: Wire (Rs.12)plus laminations (Rs.20)+Bobbin(Rs.3) plus clamp (Rs.2.50) plus varnish (Rs.5)plus other items like glass paper etc.(Rs.15).

(b) Break-up : Material, transport costs etc(Rs.3.70) plus labour cost (Rs.0.80)

(c) Break-up : Material and labour cost (Rs.4) plus transport cost (Re.0.10) plus interest, depreciation etc (Re.0.30)

As regards units' assessment of profit margins, Table 5.7 indicates that 13 sample units considered them 'low', 7 considered them 'negative' and 6 viewed them as "favourable".

It may be noted that unfavourable margins were reported by units in all product groups.[8]

Table 5.7. Units' assessment of profit margins

Assessment	No.of sample units item groupwise						Total
	Sub assembly	Electrical	Mechanical	Plastic	Packaging	Cabinet	
"Favourable"	1			5			6(23%)
"unfavourable"							
- (i) Low	1	4	1	3	1	6	13(50%)
(ii) Negative (loss)	4			2		1	7(27%)
							26(100%)

Note: 1) one subassembly unit and one mechanical unit did not respond to queries in this regard.

2) Figures in parentheses show vertical percentages.

Five subassembly units considered KEC(TV)'s rate-fixation unprofitable in relation to the higher unit costs they incurred. The units costs were further compounded by the to and fro transport costs incurred by the units in procuring materials and components from KEC(TV) and delivering

8. From the response of 22 sample units, it was learnt that profit margins ranging from 0 to 15 per cent were considered 'low' by 12 sample units whereas profit margins ranging from 20 to 40 per cent were considered by 3 units as 'favourable'.

the consignments to KEC(TV). One plastic unit also reported that the burden of transport costs incurred in commuting to and fro KEC(TV) was high. The parent firm did not bear the transport costs or incorporated them in the unit prices. Only the charitable organisation referred to occassional marginal upward revisions in labour conversion rates made by KEC(TV).

The electrical units considered a profit margin of about 10 per cent inadequate given that the volume of work farmed out was very small; profit margins would be reasonable only if there were regular and bulk work orders from KEC(TV); in their absence overheads increased considerably relative to the small volume of production. Another electrical unit's proprietor referred to increases in rawmaterial prices and labour costs but there was no corresponding increase in the unit prices set by KEC(TV).

The large mechanical component supplier reported that while heincurred loss on the work done for KEC(TV) because the parent unit did not revise the unit prices even in the context of rising material and labour costs, he found the margins on the items supplied to other customers such as ISRO, Titanium factory etc., as "satisfactory". According to a plastic component subcontractor, rates fixed by KEC(TV) would be profitable provided there were regular orders of large volume. The packaging subcontractor referred to priceundercutting from competitors as the reason for low profit margins.[9] All the cabinet makers, similarly, considered their margins very unreasonable in relation to their higher prime costs[10] and suboptimal scales of production.

Quality control and rejection rates

Table 5.8 shows that 64 per cent of the sample units (i.e. 18 out of 28) reported nil/negligible or low rejection levels (which ranged from 0 to 10 per cent of consignment) while the rest experienced high levels of rejection (ranging from 20 to 30 per cent of a consignment).

Table 5.8. Rejection levels of the sample units

Rejection level	No.of sample units item groupwise						Total
	Sub-assembly	Elec-trical	Mecha-nical	Plas-tic	Pack-aging	Cab-inet	
nil or low	5	2		6	1	4	18(64%)
high	2	2	2	2		2	10(36%)
							28(100%)

9. According to this unit, a margin of 13.5 per cent on each TV carton and fitment would be "favourable"

10. The cabinet suppliers referred to considerable increases in prices of rawmaterials such as plywood, fevicol, hardware etc., and in labour costs(especially, due to increasing wage rates of skilled carpenters). Three cabinet makers referred to 10 per cent enhancement year after year not commensurate with the increases in their prime costs.

It was the contention of some sample units that their operation would have been somewhat profitable had there been no rejection and interest payments.

According to the subassembly units, quality control of their operations involved visual inspection by quality control inspectors from KEC(TV) either at their premises or at KEC(TV) or at both places. The rejected work was easily reworked upon to pass the inspection standards. According to the largest PCB assembly supplier, rejection of its work was sometimes due to bad quality of printed circuit boards put out by the parent unit but there was no compensation for this. The largest supplier of TV coils pointed out that if the rejects as a percentage of total work done became greater than 5 per cent, work orders to the unit were discontinued completely.

As regards electrical items, quality controlling (either at the subcontractor or the main unit or both places) involved checking transformers for insulation, voltage, clamps, holes, stacking and vertical chokes for vibration through instrumentation testing procedure. One electrical unit referred to rejection of transformers on the basis of scratches etc. Two other units said that the rejected products were subject to correction at the workplace and so rejection did not lead to any wastage of materials etc.

The largest mechanical components supplier put the blame squarely on the ancillary development officials and quality control inspectors for improper quality controlling. On the other hand, AP & DS and quality inspectors pointed out that the quality of work by the two mechanical (sample) units was poor and that was among the reasons why work orders to them were either stopped or slowed down.

Rejection of work at the plastic units was attributed to factors like shrinkage, burs on edges (which were not removed properly), scratches etc. While some items could be easily subject to correction, certain others had to be written off as scrap/waste.

The packaging unit attributed its negligible rejection level to problems in stitching. In the case of cabinet-making, rejection was due to problems in handling of materials(eg. scratches), inaccuracy of measurements etc. However, these defects were capable of being corrected so as to pass the tests.

Faulty designs and inspection delays

All the sample units reported that the parent unit's "guidance and assistance" or technical advice merely consisted of supply of blueprints and samples and initiation into simple quality control techniques. But this assistance was just the necessary corollary of subcontracting; on the whole, the technological spin-off was nil or minimal. The women's co-operative among the subassembly units initially received instructions for 2 to 3 days from KEC(TV) personnel on the technique of assembling harness and wirebunches. But when the unit later on requested for further training, KEC(TV) asked the members of the co-operative to approach the charitable organisation; but the co-operative did not pursue this idea any further as it found it infeasible. The charitable organisation itself received training initially for one week from KEC(TV)'s staff. Another unit making PCB assembly said Keltron had a scheme to train workers at the ancillary units but it had not availed this facility.

Interestingly, there were problems and disputes at the stage of blueprints themselves. According to the women's co-operative, its rejection level was very high because it executed a work order on the basis of the drawings given by the parent unit but later the drawings as it turned out were found to be faulty. The unit proceeded to work again according to the new drawings made available to it. But once again the drawings were considered faulty and the work was rejected in toto. KEC(TV) staff took away the wirebunches including the rejected ones but payment was not made to the co-operative The secretary of the co-operative complained of systematic defrauding on the part of the parent firm also because while the quality control inspectors approved the consignments at the unit's workplace, the work got rejected at KEC(TV).

Further, the co-operative experienced inspection delays by quality control inspectors from KEC(TV). Another cause for complaint was the KEC(TV) officials' failure to honour their promise for providing transport arrangements for collecting the bunches quickly.

Furthermore, one electrical unit blamed the main unit for its high level of rejects; transformers needed to undergo instrumentation testing immediately for insulation. However, longdrawn inspection delays at KEC(TV) besides atmospheric changes affected the quality of the transformers and hence made them susceptible to defects. Yet another electrical subcontractor contended that sometimes he received wrong drawings from KEC(TV) which were corrected by the unit itself. Moreover, sometimes design of transformers from KEC(TV) was faulty with regard to accommodation of windings and that for certain transformers the main unit gave only specifications so that the unit had to do the designing on its own. One cabinet maker complained of not only lack of knowledge in carpentry on the part of quality control inspectors but also inspection delays leading to stockpiling of cabinets at his premises.

With a view to verifying the veracity of some of these charges, we talked to a few quality control inspectors at KEC(TV); it transpired that they, in fact, deliberately delayed inspection so as not to increase the size and cost of inventories at the main unit because of frequent changes in KEC(TV)'s production planning corresponding to changes in final product demand and marketing requirements. According to them this was a standard practice adopted by manufacturing firms in general.

Changes in production-mix at the main unit

When asked how frequent changes(sometimes quarterly) in TV models at KEC(TV) affected them, the response obtained from some sample units was mixed. Two electrical units reported that they gave rise to work stoppages involving redesigning and retooling operations. But retooling expenses were not incorporated into the unit price fixed by the main unit. While three plastic units reacted similarly,[11] one plastic unit, however, indicated that retooling expenses were taken into consideration while fixing the unit prices. Some cabinet subcontractors referred to the problems of lack of ready cash at hand to purchase materials, problems in procuring rawmaterials in right quantities at right time apart from work stoppages affecting production flow and

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11. When the TV models changed at the parent unit, the subcontractors had to change dies/tools and the earlier tools became immobilised. One plastic unit had spent Rs.600 to Rs.1000 in procuring tool-room facilities and retooling from Madras; another said it did tooling and moulding on its own and each new tool cost it Rs.600-700.

and high retoolingexpenses.[12]

In the case of subassembly tasks, the newer and better moving TV models (such as TM 1151 and 1451) generated new subassembly operations, viz. control mounting box and potentiometre assembly. To that extent traditional subassemblies became irrelevant. It was not possible to find out whether the new work compensated for the loss of previous work received by the sample units concerned. Moreover, KEC(TV)'s diversification into CTV assembly reduced the demand for handmoulded plastic components as it did not require them.

Terms of contract

As stated earlier, subassembly contracts were basically putting-out arrangements. According to the women's co-operative, KEC(TV) demanded a deposit of Rs.3,000 as security against the materials it supplied to the unit.

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12. One cabinet subcontractor pointed out non-receipt of work orders or delay of order flow from KEC(TV) in the last 3 to 4 months every year because of change of patterns/models. Another subcontractor indicated, for instance, that shells for ordinary model would have to be stopped and plywood would have to be procured for shells of deluxe model but lack of cash at hand would create material management crisis. As against this, another subcontractor reported that though production flow was affected due to model changes, the parent unit gave adequate notice whenever a new model was in the offing. Yet another cabinet subcontractor considered change of models not a big problem because only cutting of plywood varied.

Similarly, another supplier of PCB assemblies had deposited Rs.10,000 with a scheduled bank as security against the various active and passive components put out by KEC(TV). It was the contention of these two units that the security deposit was rather high but the volume of work received was so small that it was not at all worthwhile to conduct sub-assembly work. None of them disclosed whether or not Keltron paid them interest on the security deposit.

The terms of payment by KEC(TV) were usually 75 per cent against delivery and 25 per cent within 30 days.[13] But 93 per cent of the sample units (i.e. 26 out of 28 units) experienced delay of payments from KEC(TV) -- the delay ranging from one month to more than 6 months--which affected their cash-flow situation. The problem was particularly severe even for largest suppliers of PCB assemblies, mechanical components, plastic components other than mains cord, cartons and fitments (i.e. packaging). One subassembly unit attributed the delay to the three-month lean period--June, July and August--when Keltron itself faced cash-flow problems. According to one mechanical subcontractor, ISRO and Titanium paid within 30 days unlike KEC(TV) and other main units of Keltron. The largest mechanical subcontractor reported heavy cash-flow crisis as the delay sometimes extended over a year. The

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13. A few unitspointed out 90 per cent against delivery and 10 per cent within 30 days; One plastic unit which also supplied antennas on subcontract to Keltron pointed out 100 per cent against delivery of that item.

largest supplier ofplastic items other than power supply cord considered working for Keltron very unsatisfactory only because of longdrawn delays.[14] Thelargest supplier of packaging material experienced financial squeeze caused by delays from Keltron on the one hand and prompt payments to the rawmaterials suppliers on the other. Similarly, two cabinet subcontractors also felt the pressure of such delays.

According to the two plastic units which did not complain, they received payments in time; occassional delays were due to financial crunch at Keltron.[15]

High input costs

All the electrical, plastic and packaging sample units procured rawmaterials from far off places outside the State (See Table 2, 3 and 4 in Appendix 2). This procurement, involving high, long-distance costs, militated against their economics of production, apart from leading to problems of materials not arriving in time.[16] While one plastic

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14. This unit, faced with acute working capital shortage, approached Industrial Reconstruction Corporation of India (IRCI) and District Industries Centre, Trivandrum to be declared as a sick unit in order to qualify for concessional assistance. Accordingly, the unit was recognised as "sick".

15. In theopinion of the largest supplier of cabinets, delay of payments from KEC(TV) was a recent phenomenon because of financial problems faced by the TV unit and Keltron in general.

16. One electrical unit's proprietor pointed out that he himself had to go around places to ensure good quality and timely supplies.

subcontractor referred to fluctuations in the prices of petroleum-based rawmaterials, another plastic subcontractor indicated cost increases due to considerable and monotonous rise in prices. The cabinet subcontractors too referred to considerable increases in prices of all materials and items over time.[17]

Employment, wages and payment system

According to Table 5.9, there were 416 persons employed by the sample units at the time of the survey. Women constituted about 32 per cent of the total (i.e.133 out of 416). All women were categorised as 'unskilled' and 'helpers'; the 'skilled' workers were invariably men. Thus, skill classification and sexual division of labour was intertwined at most of the units. Apart from the division of jobs into 'male' and 'female' types[18], well-known reasons such as low militancy and low wages based on sexual discrimination accounted for the preference of the employers for women.

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17. The cabinet subcontractors procured plywood and sunmica from the local agency for Western India Plywood(as specified by the main unit). The rest of the items such as hardwares, fevicol, gum tape plain, canvas, lamination sheet, screws, nails, paint, styling items, were procured etc., from a combination of local and outside(the State) sources.
18. For example, women performed subassembly tasks such as bending, fixing, plugging the components on PCBs, twisting, tinning, soldering(which was considered by some employers as skilled or semi-skilled operation), winding etc. At the plastic units, moulding was considered 'skilled' and was usually done by men. At the packaging unit, skilled men did corrugating, slotting, cutting, creasing and stitching. Unskilled men and women did pasting, pressing and stapling -- all considered as 'female' jobs. In cabinet making, skilled work by men involved carpentry work; unskilled work by women involved moving, painting, polishing lamination sheets and cleaning cabinets.

Table 5.9. Employment and Payment Systems

Item group (no.of units)	No.of empl-oyees	Men (No.)	Women (No.)	No.of persons on time-rate		No.of per-sons on piece -rate
				Monthly	daily	
Subassembly(7)	103[a]	56	47	25	--	39
Electrical(4)	31	15	16	2	--	29
Mechanical(2)	28	25	3	28	--	--
Plastic(8)	106	80	26	79	27	--
Packaging(1)	16	13	3	16	--	--
Cabinet(6)	132	94	38	72	31	29
	416	283	133	222	58	97

Note: (a) includes 30 disabled persons at the charitable organisation (Cheshire Home).

(b) Apart from the above disabled persons, 9 workers belonging to 2 subassembly units did not fall under any payment system.

There were clear instances (at least 6, cutting across all item-groups) of adjustment in labour costs by way of retrenchment of some workers due to cutbacks in production consequent upon lack of work orders from KEC(TV)[19]

19. Variation in the volume of subcontract work from KEC(TV) did not reflect in variation in employment at highly diversified units, possibly because the workers employed at those units were fully utilized in meeting orders from customers other than KEC(TV). According to the largest PCB assembly supplier, labour turnover at the unit was high but there was a large reserve pool of labour ready to come in.

The skilled workers were the last to be retrenched, especially in cabinet making, despite the labour overhead costs involved. They were retained in order not to be shorthanded when production picked up later. Unskilled workers and helpers, especially women were the first to be retrenched; some of them were taken back when quantum of work rose to a sufficiently reasonable level.

Table 5.9 also shows that out of 377 employees on time-rate and piece-rate systems of payment, 74 per cent (i.e. 280) consisted of time-rate workers; the remaining 26 per cent was paid piece-rates.[20] It is difficult to say whether specific payment system is related to type of activity or some other variable as size of the sample units.[21]

The payment systems and division of labour at some sample units were closely interconnected. For instance, consider the electrical units. Here piece rates were fixed on individual items (e.g. transformer or choke) as well as on the various elemental operations such as winding, coring,

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20. Thirty disabled persons and 9 workers at two subassembly units did not belong to any system of payment mentioned above. The 5 members of the women's co-operative shared revenue (total labour conversion charges) equally and the 4 workers at a PCB assembly unit had been employed without any payment for two years as shamelessly pointed by the proprietor of the unit himself !

21. As to why firms tend to go for time-rate system may have something to do with the larger size and higher capital intensity of the units or labour (especially skilled hands) scarcity encountered by them.

varnishing/vaccuum impregnation, stacking, stripping/soldering etc. Piecerate system was preferred because, in the opinion of the proprietors concerned, it led to cost-reduction much more than time-rate system did; it increased productivity;[22] it avoided 'labour problem'; and more importantly, it enabled easy identification of the worker responsible for defects or material loss/wastage. No payment was made for the work repeated by the worker concerned. And the worker responsible for material loss/wastage (e.g. in relation to paper, varnish, oven breakdown etc) was taxed commensurately.

The cabinet subcontractors represented a mixture of strategies and experiences. At one unit, the division of labour was such that there were five types of operations to make a TV cabinet; each type was paid on piece-rate basis.[23] At another unit, while cabinet-making was awarded time-rates, furniture business was organised on piece-system basis. The largest supplier preferred time-rate system because the piece-system had led to quality problems and hence a high percentage of rejects. Whereas monthly target of production was fixed, any extra production was carried on by paying

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22. It may be noted that at some of the plastic units, daily payment system was replaced by piece-rate system when work orders surged. On the other hand, a cabinet subcontractor reverted to time-rate system as he found it difficult to organise piecework due to materials management problems.

23. It may be interesting to note that this subcontractor initially brought to Trivandrum 40 to 50 carpenters from Bangalore and Madras, bearing their trainfares and accommodation expenses. He had also drawn some workers away from the subcontractors making cabinets for Dyanora TV. But soon they were sent off as there was not sufficient and steady work-order flow from KEC(TV).

the workers production incentives (e.g. additional pay of 10 to 15 per cent of their wage/salary levels). Interestingly, this subcontractor had employed more women workers than other cabinet subcontractors so as to reduce labour costs and thereby meet KEC(TV)'s demands for price cuts in the price-fixation-procedure.

Let us now consider some rough magnitudes of average monthly payments by the sample units. Table 6.0 shows the number of skilled and unskilled workers falling under different ranges of payment by 17 subcontractors (in the 6 item groups) employing a total of 248 workers. It is evident that the maximum range in which skilled workers tended to concentrate was Rs.601-700. This was lower than the minimum range (Rs.667-833) for the skilled workers (with 5 years experience) at KEC (TV) as could be worked out from Table 5 in Appendix 2. Similarly, the maximum range of payment to the unskilled workers at the subcontractors was Rs.401-500, although there was a tendency towards concentration of the unskilled in the range Rs.301-400. Again from Table 5 (Appendix 2) the comparable range (i.e. for the unskilled) at KEC(TV) could be seen to be higher at Rs.542-596.

It must be stated that the average monthly payments varied considerably between the subcontractors reporting this information. This variation could be related, inter alia, to the variation in the number of work-days between the units. So, instead of average monthly payments, daily wage rates for different types of workers at 23 sample units and at the parent unit are computed (See Table 5 and Table 6 in Appendix 2). Table 6.1 shows the range of daily rates as also the median daily rates paid by the subcontractors in comparison with the average daily rates of roughly comparable types of workers at KEC(TV). It is evident that the daily wage rate differentials between subcontractors and the main unit, especially for unskilled workers, were considerable.

Table 6.1. Daily wage rate differentials between subcontractors and KEC(TV) corresponding to comparable typology of workers

	Skilled	Unskilled	Helper	trainee	Instructor/ Supervisor or foreman	Storekeeper/ Clerical typist
Range of daily rates at 23 subcontractors (Rs)	7-25[a]	2.5-15	2-8	1.4-7.5	4-31	10-31
Median Value (Rs)	16	6	5	6	17	15
Daily wage rate at KEC(TV)	25[b]	19[c]	19[d]	19[e]	33[f]	26[g]

a. By the time the survey was over, the daily rate of skilled carpenter had increased to Rs. 35/-

b. Average of daily rates corresponding to designations 3,4 and 5 in Table 6, Appendix 2

c. Average of daily rates corresponding to Designations 1 and 2 in Table 6, Appendix 2.

d.= c

e = c

f : Average of daily rates corresponding to Designations 6 & 7 in Table 6, Appendix 2

g : Average of daily rates corresponding to Designations 4 & 5 in Table 6, Appendix 2.

Note: Daily wage rates (Rs) corresponding to designations from 1 to 7 respectively were: 18.07, 19.84, 22.21, 23.79, 27.73, 31.68 and 35.03.

The differentials in daily wages rates could be attributed to the virtual absence of unionization at the sample subcontractors. Many units employing 10 or more workers did not adhere to essential clauses of the Factories Act. Only 4 subcontractors reported payments in cash or kind as an extra to the basic wage they paid. For instance, the Charitable Organisation provided lunch and tea (two times) apart from the miserable monthly stipends to its 20 female workers (Rs.70 each) and one male instructor(Rs.120). One plastic subcontractor provided benefits like bonus, boarding etc. At the packaging subcontractor, the workers received ESI facility, 1 cash leave for every 20 days and holidays according to the company rules, but no P.F.facility. The largest cabinet subcontractor said he offered some advances apart from tea and tiffin.[24]

Alternative sources of supply outside Kerala -- a controversial issue between KEC(TV) and some sample subcontractors

Contrary to the allegation of a TV coil subcontractors that the parent unit procured the item from other sources at the cost of local suppliers, it was discovered that KEC(TV), in order to reduce its costs, had started procuring them

24. We could not interview workers on wages and other benefits outside workplaces or at their residences. The owner/ foreman did not allow interviews with workers at the workplace. Also, language barrier in part added to the difficulty of approaching workers.

through purchase orders with larger firms outside the State (e.g. Pune/Madras). The outside units mass produced and supplied (to the entire TV industry) at cheaper rates than that of local subcontractors. Similarly, CTV driver transformers were procured from large-scale ancillaries in Madras.

In the case of the electrical subcontractors, a subject of dispute at the time of the survey was that KEC(TV) procured transformers from outside the State or produced them in-house at their cost. Our investigation and enquiries revealed that the new transformers(potcore transformer and SMPS or E-core transformer) had indeed been manufactured in-house at the Transformer Winding Shop of the Industrial Electronics Plan situated within KEC.[25] This was indeed a case of intra-firm subcontracting.

In-house manufacturing of the above transformers had been preferred to subcontractingout because of inadequate quality control on the part of the sample units concerned.[26]

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25. The SMPS transformer required for Keltron CTV sets was also manufactured in-house at the same place.

26. Their general allegation was that there had been proliferation of small units interested only in making quick, short-term profits at the cost of quality standards set by Keltron.

However, in early 1984, it was learnt from the Ancillary Purchase & Development Section that KEC(TV) planned subcontracting out potcore transformer to a sample electrical unit on an experimental basis.[27]

That KEC(TV) had been lifting TV cabinets from suppliers outside the State to the detriment of the local subcontractors was a misapprehension on the part of the sample cabinet subcontractors toward the parent firm at

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27. According to the Costs & A/Cs Section of the Industrial Electronics Plant (IEP), the unit cost and its break-up of the new transformers was as follows:

(1)	Unit cost of Potcore transformer for TV :	Rs.39.20
	Material cost of...........do......... :	Rs.30-70
	Labour and overhead cost of......do.....:	Rs. 8-50
(2)	Unit cost of SMPS transformer :	Rs.43-33
	Material cost of......do....... :	Rs.31-27
	Labour and overhead cost of.....do......:	Rs.12-06

The personnel at IEP's Transformer Winding Shop gave the costing details as follows:

Time taken for winding potcore(all materials supplied by Keltron)	: 1.5 hrs.for 1 no.
Time taken for winding SMPS (all materials supplied by Keltron)	: 3.5 " "

Hourly labour and overhead rate at the winding shop was Rs.16 plus 10 per cent margin (for internal movement); hourly labour cost rate was Rs.9-23; and hourly overhead cost rate was Rs.6-77

The point was that by subcontracting the above two transformers, the hourly labour and overhead rates would reduce by 2 to 3 times.

the time of the survey.[28]

After the survey was over, when the topmanagement and production planning personnel at KECT(TV) were questioned in this regard, they summarily refuted all the allegations by local suppliers. They argued that KEC(TV) faced strong competitive pressure to reduce prices of its TV sets whereas the local cabinet suppliers, having become richer, were trying to form a cartel so as to increase prices and threaten not to supply. So, the topmanagement of KEC(TV) and Keltron decided to go for procurement outside the State. They contended that the prices of the TV cabinets supplied by subcontractors in Delhi, Hyderabad and Madras were indeed cheaper than the local procurement prices by Rs.80-100 and the landed

28. Four sample cabinet subcontractors had referred to uneconomical procurement from Hyderabad, Madras and Bombay. According to the proprietor of a unit(which had already gone under), the quality of the cabinets procured from Bombay was poor in comparison with local suppliers' work; besides, though the price per cabinet was lower in Bombay than in Trivandrum, the landed costs of the cabinets in TVM(i.e. the price of procurement in Bombay plus high long-distance transport costs plus TA/DA accommodation allowances to the quality control and purchase department officials was greater than the unit price quoted by the local subcontractors. According to the largest cabinet supplier, there existed actually a difference of Rs.5 between the local unit price and the unit price in Hyderabad due to relatively lower labour costs in the latter place. But when oneconsidered the landed cost (including sales tax/octroi), it was greater than the local unit price by about Rs.100/- ! Another cabinet subcontractor pointed out that he had taken the initiative in forming a TV cabinet suppliers' association (consisting of 4 other sample units and two units in Kottayam) in order to block KEC(TV)'s move to source from outside. But there was hardly any consensus between the suppliers in negotiating with Keltron, the reason being inter-firm competition to get work orders for lowest quotation.

cost[29] had never been greater than the local procurement prices. In fact, it had been somewhat less than the local unit cost. For example, AP & DS informed that the rates per cabinet of the TV models TM 1151 DS and TM 1451 in Madras were Rs.345 and Rs.365 respectively whereas the corresponding local unit rates were Rs.375 and Rs.385 respectively and that the landed cost in both cases was less than the local prices by Rs.10 !

Furthermore, procurement from outside parties was not a deliberate move on the part of KEC(TV) at the cost of local suppliers; procurement from outside subcontractors in 1980-81 and 1982-83, for instance, was necessitated by the inability of the local parties to supply KEC(TV)'s requirements of shutter-type cabinets in time according to the work orders and delivery schedules given them.

During our subsequent visit to the main factory in March-April 1984, we came across some evidence in the AP & DS records which revealed that local suppliers indeed could not meet the delivery schedules set by KEC(TV). At that time three sample subcontractors could not supply the finished consignments of shutter-type cabinets despite the expiry of

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29. That is, price of procurement from outside the State plus transport cost plus insurance charge and damage cost plus expenditure on inspection personnel such as a senior supervisor or engineer or even operator.

delivery dates by about 3 months. According to AP & DS, even the largest supplier had not purchased the styling items required for making the cabinets.[30]

Technological obsolescence and irrelevancy of traditional subcontract-business

The number ofprinted circuit boards had reduced from 5 in TM 851 series to 3 in the relatively low-cost models-- a cause for the decline in the volume of work or non-receipt of orders, not perceived by the sample units concerned. Similar was the case of technological change in terms of the replacement of traditional transformers and chokes by newer transformers (e.g. in 1050 economy model) and in terms of lower mechanical component count and replacement of mechanical by plastic items to some extent.[31]

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30. In this connection, we may note that KEC(TV) had been pressurised upon by suppliers of styling items because some of the cabinet subcontractors had not yet settled their accounts with them; we gathered this information from a source in AP & DS. We may also note here that although it was found on their own, after the survey it was learnt from AP & DS that KEC(TV) put out front panel and front panel plate for TM 1151 and 1151 DS cabinets and only front panel for TM 1451 model.

31. The sample mechanical units were unaware of this technological change. Instead they alleged that KEC(TV) purchased some mechanical items from sources outside the State at higher prices (when long-distance transport costs were included) instead of relying on the local ancillaries.

Moreover, during the survey KEC(TV) procured only two injection-moulded plastic components from four of the sample plastic units concerned and three items from a new subcontractor. This was contrary to our surmise that substitution of plastic items for certain mechanical items in the new economy models would increase the work-load on plastic ancillaries. While the 851 series required 8 to 12 plastic fixing items in the past, the new models required only 3 hand moulded plastic items (LED holder, busher, and P-clamp) and two injection moulded plastic items. Thus, on the whole the work farmed out to plastic subcontractors had actually reduced quantum-wise.

Diversification possibilities

The subassembly subcontractors were highly product- and market- specific. That is, their operations were characterized by excessive or narrow specialisation; their close integration with the parent firm made them inherently vulnerable. The point was that unless they were financially strong enough, they did not have much scope to diversify into other product ranges and markets.

The electrical subcontractors seemed to have relatively easy diversification possibilities. Whereas many units which started manufacturing main transformers and vertical chokes had closed down, those that continued to exist withstood lack of workorders for them from KEC(TV) due to possibilities of making voltage stabilisers, emergency lamps, battery chargers, welding transformers, voltage line correctors and other small equipments for sales in open market.

The mechanical subcontractors found alternative, large customers in ISRO, Titanium and HMT, Ernakulam. It was striking that the plastic subcontractors were in general highly diversified not only by product but also in terms of number of customers. Keltron grouping was their main customer. Similarly, the packaging unit was very highly diversified. The cabinet subcontractors on their part found an easier alternative in furniture (job work) business that was said to be booming.

Table 6.2. gives us an idea of the degree of diversification of the sample units (also see Table 1, Appendix 2)

In all, there were 21 (75 per cent of total) sample units that could be said to be diversified sourcewise.

An interesting observation in this connection was that the sample units which reported "favourable" profit margins were units makingplastic items for more than two customers. At the same time there existed a wide range of fixed capital value and number of employees between these units. This seemed to suggest that size was not as important

Table 6.2. Sample Units' extent of diversification

Extent of diversification	No. of sample units item group wise: Subassembly	Electrical	Mechanical	Plastic	Packaging	Cabinet	Total
1. nil(i.e. complete dependency on KEC(TV))	5	1				1	7(25%)
2.One customer other than KEC(TV)	2	2		1		5	10(36%)
3.More than one customer other than KEC(TV)	-	1	2	7	1	-	11(39%)
							28(100%)

as degree of (source) diversification in explaining the viability of these units.[32]

32. Note that the higher profit margins on plastic components might also reflect an imperfect informational linkage between KEC(TV) and the plastic subcontractors. That is to say, KEC(TV) could have imposed much sharper price cuts on these units had it known their cost-breakdowns.

On the other hand, among the units with "low" profit margins, one could find subassembly and cabinet subcontractors largely dependent on KEC(TV). Again there existed a wide range of fixed capital and employees between these units suggesting thereby that lack of diversification was perhaps more important in explaining their economics than their size. As pointed out earlier, those cabinet makers which did not go under were dependent on furniture business as a hedge against poor production and sales performance of KEC(TV).

Sample units' overall assessment of their subcontracting relation with Keltron's main TV Unit:

According to Table 6.3, whereas only three units were satisfied with their economics, 25 sample units (89 per cent of the total)considered their liaison with KEC(TV) "unsatisfactory" and "non-viable" for all or any of the reasons pointed out in the foregoing discussion.

Consider the "satisfactory" cases. Among these, one subassembly subcontractor was clearly a special case in that it was a charitable organisation which received work (in the light of Keltron's avowed "commitment to socio-economic causes") primarily for disabled persons (to while away their time) at whatever rates set by KEC(TV). Another subassembly

Table 6.7. Assessment of subcontracting arrangement: opinion poll

Subcontractor's Assessment	No.of sample units item groupwise						Total No.
	Subass-embly	Elec-trical	Mech-anical	Plas-tic	Pack-aging	Cab-inet	
"Satisfactory"	2			1			3 (11%)
"Unsatisfactory" and "non-viable"	5	4	2	7	1	6	25 (89%)
							28 (100%)

subcontractor was satisfied with doing PCB assembly with very low overhead costs and unpaid apprentice workers. This unit, although very young and new to subcontract business, was financially strong (in terms of proprietor's high level of savings) and had definitive plans to expand and diversify its operations in near future so as not to totally depend on the parent unit.[33]

33. This subcontractor planned to shift the workplace from his residence to Veli Industrial Development Area, Trivandrum. The projected fixed capital, working capital and sales turn-over were Rs.2 lakhs (for building and machinery), Rs. 1 lakh and Rs.5 lakhs respectively. The new workshop was to be financed out of personal savings plus borrowing from the State Bank of India and Kerala Finance Corporation at an interest rate of 18 per cent. The proprietor referred to undue delay in getting the amount from these two sources. The new unit would make new products like control panels, fabricated parts and transformers (new types) and supply them to Keltron, ISRO, Electricity Board etc.

The third subcontractor was a plastic unit satisfied with his dealings with KEC(TV) in particular and Keltron grouping in general on the grounds of regular work-order-flow, "reasonable" profit margins and fairly prompt payments. This unit was a successful case and had definitive future plans of further expansion and diversification.[34]

Let us consider the "unsatisfactory" cases according to their degree of diversification. There were 5 subcontractors--three subassembly, one electrical and one cabinet--totally dependent on KEC(TV). Three of them--the women's cooperative, one TV coils unit and the cabinet subcontractor--eventually closed down. It was interesting to note that the ages of these fully dependent units were equal to or less than the average age (5 years) of the sample units. They received irregular, declining or low-volume work orders. Their operations were significant (in terms of their shares in the main unit's total purchase of the item concerned). Their margins were low or negative. They suffered from high

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34. According to the proprietor of this unit, his was the only ancillary supplying to Keltron grouping that had diversified (with permission from District Industries Centre) its activity into 3 lines of production viz., plastic, metal and leather. The unit had already developed 140 plastic components, 96 metal components and 3 leather items. The proprietor planned to build a factory in a backward suburban area of Trivandrum. He planned to make polythene pipes and commercial items like bags and buckets on a largescale. During the survey, he was negotiating with Indian Overseas Bank for a loan to purchase an automatic extrusion machine required for large-scale production of the above items. He had also approached HMT, Ernakulam for supplying nylon moulded items and Instrument Corporation, Palghat, for work orders.

rejects, inspection delays etc. However, the precarious subcontract position did not matter to one subassembly unit and the electrical unit. The subassembly unit (doing PCB assembly) was set up by an employee of Keltron. For him, the subcontract activity was relatively unimportant since he had other retail and business interests.[35] The electrical unit was financially strong and had definitive expansion/diversification plans; in fact, it had already gained a foothold as a parent firm cum subcontractor by the time the survey was over.[36]

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35. The proprietor of this unit worked in Service Supervision, Marketing Division of Keltron; he had a retailing outlet for Keltron radio sets and calculators.Moreover, he organised coaching classes in radio/TV and electronics in general.

36. The case of this subcontractor was extremely interesting. During the pilot survey, its proprietor planned manufacture of tube light chokes, frame and starters for sales in open market and of projectors and transformers on subcontract to Keltron's radio unit in order to overcome the production-flow crisis due to full dependency on KEC(TV). During the second phase of the survey, it continued to supply main transformers and chokes, albeit in very small quantities, to KEC(TV). But it had reorganised itself by then under a new name. It arranged for import of electronic components from abroad and did marketing of components made in India.It had employed 3 engineers (mechanical, electrical and electronic) to undertake revival of sick units on commercial subcontracting basis. That is, it offered technical assistance and materials managementassistance to sick units and marketed their products under its label. Thus, it marketed calculators, heatsinks of all varieties, voltage stabilizers, token display systems and emergency lamps made by other units including sick ones). It offered specialist technical assistance such as anodizing the sinks which required correct mixture of chemicals. It undertook impregnation(vaccuum varnishing) of the transformers of another company which subcontracted this work in order to avoid a fixed capital investment of Rs. 50,000, This electrical subcontractor also supplied relays to Electricity Board and offered consultative assistance to small scale units about STQC/TDC, Testing and Development Centres, Directorate of Technical Assistance etc.It also received a licence from the Dept.of Electronics under the sponsorship of Keltron to make 10,000 TV sets per annum.In this connection,the proprietor planned to form a common unit in a backward area of TVM by collaborating with other small units which also received licences for TV making. The objective was to bring out economical and quality sets on the basis of semi-automatic mechanisation.

Consider another set of 10 subcontractors--two subassembly, two electrical, one plastic and 5 cabinet--which had one customer other than KEC(TV). At the time of the survey, the two subassembly subcontractors were largest suppliers with regard to PCB assemblies and TV coils. They faced the prospect of imminent closure as they did not receive any work order from KEC(TV) for a few months. Work orders to them from the alternative unit(Keltron's radio unit) also had either stopped or become too insignificant to make any difference. However, the PCB assembly subcontractor could survive on the basis of his financial strength and other business lines (e.g. repair servicing of consumer electronic items). After the survey, it was learnt that the TV coils supplier could manage to survive on the basis of work orders for PCB assembly and control mounting box and potentiometre assembly from KEC(TV).

The two electrical units faced lack of work orders (with respect to driver transformers) and slowing down of orders (for main transformers) respectively. One of them managed to survive because of compensatory work order support from the alternative customer(Keltron's radio unit). The other averted a crisis because of its open market sales of certain items. Both of them had financially strong proprietors. One of them in addition envisaged future plans of expansion.[37]

The one plastic subcontractor under this division reported loss due to very irregular and suboptimal work from KEC(TV) as also from its alternative customer(again Keltron's radio unit). However, this loss for the proprietors seemed to have been compensated by the returns of another of their'split' unit operating in a different business line (e.g. film studio).

Among the cabinet subcontractors, two had closed down their operations in relation to KEC(TV). One subcontractor depended on another TV manufacturer[38]; the rest depended on furniture (job) work. The largest cabinet supplier was financially strong and had future plans to expand and diversify[39]. On the whole, we may emphasize that in the

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37. This unit(supplier of driver transformers for TV)Planned expansion (to be financed through bank borrowings)through manufacture of new products such as (a) deflection yoke (for deflection of picture) used in monochrome and CTV sets & (b) relays;. Their production required high investment outlays.

38. This was British Physical Laboratories (BPL) which was situated in Palghat and had collaboration with Sanyo,Japan.The subcontractor concerned supplied this customer cabinets for monochrome sets. But at the time of the survey, he faced stockpiling after executing the work order from BPL because the latter's production had been severely affected for 6 to 7 months on account of strikes.

39. He planned shifting to a factory building in an Industrial Development Area where the workforce would be doubled and 90 per cent of them would be women so as to reduce labour costs further. He planned TV manufacturing provided KEC(TV) supplied him critical items like picture tube etc.

context of low off-take of Keltron's TV sets, cabinet-making appeared to be a case where despite diversification possibilities, the disadvantages of high cost (of rawmaterial and skilled labour) were working against cabinet subcontractors.[40]

Lastly, let us consider the third set of 10 subcontractors--one electrical, two mechanical, 6 plastic and one packaging--which had more than one customer other than KEC(TV). Two plastic units had already closed down[41]. The electrical unit, though negatively interfaced with KEC(TV) could survive because of steady-flow orders from Keltron's radio unit and its open market sales. Also, itwas financially strong. The two mechanical units, similarly, found "attractive" subcontract work from alternative customers. The packaging unit, despite low profit margins and delay of payments from Keltron, could survive on the basis of regular orders from a number of alternative customers. Among the plastic units, the precarious position vis-a-vis KEC(TV) did not matter to the proprietor of a unit because his primary activity was employment at

40. It may be noted here that a few cabinet subcontractors considered the prospects for their business very bright in the light of the Special TV Plan. In early 1984 it was found from AP & DS that while work orders were renewed to one unit which had closed down, another sample subcontractor(who also supplied to BPL) stopped supplying cabinets; some of the subcontractors had acquired licences to make TV sets on commercial subcontract to KEC(TV).

41. One of them, because of the dissolution of the partnership. The break-away partner had opened a footwear shop. He alleged that the quality control inspectors of Keltron demanded bribes for renewal of orders. On the other hand, the quality inspectors said that some units had approached the Managing Director of Keltron and made such complaints because some of them had been blacklisted by them for not having met the strict quality standards of KEC(TV).

VSSC as an engineer. Another plastic unit's proprietor found agency business to be more lucrative than working for Keltron as a subcontractor.[42] Two plastic units (which were largest suppliers of mainscord and other plastic components respectively) received more or less regular work orders from all of their customers; they enjoyed "favourable" profit margins. But their main complaint was with respect to delays of payments from KEC(TV).

Section 3: KEC(TV)'s version of its subcontracting relationship with sample units

While the main unit's version of its relationship with local small scale suppliers more or less corroborated many findings and observations from the subcontractors' side, we may note here a few other aspects of the subcontracting relationship.

Consider the choice of subcontractors. The interviews with the personnel at AP & DS revealed that cost, quality

42. The proprietor earned attractive commissions by co-ordinating buyers and sellers of machine tools, engineering equipment, electrical goods, temperature controllers (i.e. process controlling equipment) etc. His chief customers were ISRO, Electricity Board, PHED/PWD, Keltron (R & D) etc.

and reliability were the factors that were primarily taken into account while selecting and maintaining relationship with subcontractors.

As regards non-technical assistance, at the time of the survey, none of the subcontractors received any financial assistance from the parent firm. It transpired however that initially some units had received some financial aid when they experienced cash-flow crisis.

In general, the parent unit supplied almost all the materials and components required for subassembly operations performed by the subcontractors concerned. The major factors governing the extent of materials put out to small-scale parties included (1) advantage to the main unit in making bulk (instead of small-lot) purchases, (2) the situation with respect to inventories, changes in TV models, materials management problems, (3) the nature of the item/work farmed out for subcontracting, (4) local availability and (5) the motive of the parent unit to streamline its operations over time. The units making non-subassembly items were informed of the sources of supply and asked to procure materials. etc., on their own.[43]

To the extent the subcontractors received materials and components from the main unit, the subcontractural arrangements were fixed up by taking into account only the labour conversion charges. In the case of the subcontractors other than subassembly units and where the subcontractors received some materials from KEC(TV) and the rest on their own from the sources specified to them by KEC(TV), the price of the materials supplied by KEC(TV) was deducted from the unit price of the product/operation concerned.

An overview of the subcontracting arrangement between KEC(TV) and the sample units

From the foregoing description of KEC(TV)'s relationship with sample units, it appeared that the assistance from the main unit was confined to the (minimal) technical aspects and as a result the subcontracting units were left to themselves in the financial and managerial aspects of their operation.

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43. It is interesting to note the gradual discontinuation of material supply in respect of certain subcontracts. Thus, for example, KEC(TV) had stopped supplying materials like wires, coils, plastic formers and sleeves which were required in assembling TV coils; it also had discontinued supply of styling materials (e.g alluminium beedings, bottom stage strip, viewhood, that is, border of picture tube, shining plates or emblems, etc.) to TV cabinet subcontractors. In this regard it was also learnt that some subassembly units, which failed to execute the work orders did not return the materials to the main unit. This may also have influenced KEC(TV) to discontinue the practice of material supply to the subcontractors.

To put it differently, the success of the subcontractors was then left to be saddled with their competitive capability in organising their manpower, financial and managerial resources.

The subcontracting relationship was unstable. There was fast changing high birth rate and death rate of the small scale suppliers. For a number of subcontractors, production became non-viable due to many reasons. There were uncertainity and irregularity of work orders from KEC(TV) , with long interspersed intervals of very low or no work orders. Some units were abandoned. Too many suppliers were given uneconomical fragments of a total work the volume of which itself was sub-optimal. There was lack of specialisation in many cases.

The labour conversion charges /unit prices fixed by the parent unit were unrealistic; they were low in relation to the rising costs the subcontractors incurred. Payments from Keltron were more often delayed whereas payments to raw-material suppliers had to be made immediately. Hence there was the two-way squeeze. Inspection delays often led to stockpiling. In some cases, consignments were rejected without specifying proper reasons; KEC (TV) did not pay at all for the work done according to the given drawings, quality controlling was not proper and the rejection rate high. Security deposit against materials supplied by the main unit was found to be excessive especially in relation to the paltry work they received, and therefore, continuing their operations was no more worthwhile.

Frequent changes of TV models at the parent unit gave rise to problems of retooling. The retooling expenses were not taken into account in the fixation of unit price. Some units alleged loss of business due to KEC(TV)'s procurement from outside Kerala.

It does not follow, however, that KEC(TV) indulged entirely in deliberate harassment of the subcontractors. There were certain critical factors that moved the main unit to pass-the-buck as it were on to its subcontractors.

The off-take of Keltron's TV sets in the market, as also reported by many subcontractors, was often low. There was instability and seasonality of demand. Production planning at KEC(TV) was often haphazard and disrupted due to frequent labour inflexibilities and agitations and/or problems in materials management. Technological change by way of simplification of design structure and low component count affected the volume of work farmed out for subcontracting by the main unit. Moreover, KEC(TV) preferred in-house manufacture of new transformers to the substandard products supplied by the subcontractors concerned. And items like driver transformers for colour TV sets, TV coils and TV cabinets were procured from suppliers outside the State so as to take advantage of lower cost and overcome the technical incapacity and supply-bottlenecks at the local ancillaries. Furthermore, sometimes inspection delays were deliberately contrived to prevent stockpiling of inventories and the consequent increase in inventory costs at the main unit--which pointed to upsetting of production planning as a result of product market fluctuations.

All the above factors accounted for uncertainty, irregularity and sub-optimality of work orders which adversely affected the production flow and viability of many a subcontractor. In this precarious milieu, the effective survival of some units was overwhelmingly dependent on their degree of diversification of both items/ operations and customers. Other factors such as older age, larger size, financial strength, other business interests and labour cost adjustment methods also seemed to have given a fillip to their existence and growth.

A safe conclusion is that the more diversified the firm, the more stable it is in the subcontract-business. Viability is then more a function of multiple sources of workorders rather than technical competence. This again suggests that total dependence, even on a large-scale -- is counter productive to the growth of subcontracting units.

The tie-up of dependent subcontractors with the fortunes of the parent firms apart, unequal bargaining in the determination of the terms and conditions militates against the growth of the small scale units in subcontract position.

CHAPTER 5

CONCLUDING OBSERVATIONS

Subcontracting as a specific organisational form has been a mainstay of industrial production in distant past. It has been so, interestingly, in several industries-traditional and modern--even in the contemporary period. The analysis in the foregoing chapters -- not only by way of review of literature but also in terms of industry (electronics) and case study (Keltron's TV project) specifics --has given us a clearer picture of the conditions under which subcontracting relationship emerges and operates in the industrial system. The discussion has highlighted three essential components in this study: (1) the factors governing the decision to subcontract out, (2) subcontracting as a means to several ends from the point of view of parent firms, and (3) subcontracting as largely asymmetrical, unsymbiotic and unstable relationship as far as the subcontractors are concerned. This chapter summarises the main lines of argumentation and posits the role of subcontracting relationship in a perspective of the integrated development of large and small industries.

The decision to verticalize or subcontract

We argued that the 'make-buy' decision of an enterprise is a function of the technology it uses and the conditions of profitability it is subject to. However, it is not easy to assess the actual businessmen's calculus whether to vertically integrate or subcontract to small firms. Nor is it easy to assess the inducements that make the small firms to go for contractual ties with larger firms in a general sense. All these are situation specifics.

We may say in general that the extent of vertical integration or its reverse subcontracting option is affected by scale economies. In traditional industries based on the system of batch production of low technology, 'discrete' products with limited or without any technical economies of scale and subject to fast changing demand, social divisionof labour and specialization through subcontracting has been by and large the form of production organisation. In modern industries where the final assembly and the production of certain critical parts (especially those involving firm specific, proprietary technology) are subject to scale economies, one would expect their internalisation by a large firm atleast at their respective "minimum efficient scale of production" so that there would be no incompatibility between final assembly and parts-making. Since not all the items/operations can be internally produced at their respective efficient scales of production, it is very reasonable to expect the tendency to purchase and subcontract out certain standardized and non-standardized items. The subcontracting relationship thus emerges and sustains itself on the hope that the firms which supply the components and processes supply a number of firms, and so achieve economies of scale, which their customers would not achieve if they did not buy out.[1]

It would seem that if a fully integrated firm wishes to expand its output in response to a spurt in demand, then costs will rise quickly because it would take longer to expand its capacity or enter afresh into subcontracting arrangements. If it wishes to reduce its output consequent upon a fall in demand, then costs do not fall quickly because of increased overheads and decreased flexibility in dealing with labour. Moreover, if it is entirely dependent on all supplies from within its operations, then any disruption in supplies will result in large revenue loss than when it is also dependent on outside, multiple sourcing[2]. Thus, given the costs to vertical integration, larger firms would tend to economise fixed capital and concentrate investments in core processes and critical parts where up-to-date technology is crucial to survive or win domestic/

1. See the classic work by C.F.Pratten, Economies of Scale in Manufacturing Industry, Cambridge University Press, 1971,p.281.
2. For an excellent illustrative analytical model on these lines, see Andrew Friedman, op.cit.pp.123-126

foreign competitive onslaughts, and then buy out standardized and non-standardized items from outside parties -- large and small--through purchasing and subcontracting arrangements.

The central point is that there are supply and demand factors that determine the discretionary power of the top-managements of larger firms to choose between the two alternatives: direct control over all production on the assumption that demand will be stable <u>or</u> flexibility through subcontracting on the assumption that supply of intermediate items and final product demand will be unstable in future.

Since it is very important for top-managements to form some view of the likely stability or instability of demand in future as also of the likely smoothness of flow of parts, components and subassemblies(modules) from existing suppliers and from their in-house facilities and since it is extremely difficult to estimate these intangible factors, we find in reality firms choosing very different mixes of control and flexibility. This also explains in part why there were differences in the extent of subcontracting relations between firms or why firms (even if they are similarly sized) alter the relative importance of subcontracting relations over time.[3]

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3. ibid.

With the onset of microelectronics it might look at first sight that the conventional problems and considerations pointed out above stand to modification. For, computerised manufacturing permits efficient verticalisation at one place. However, it also permits centralised control over decentralised production. Since it erodes economies of large-scale, it also permits mainstream companies to offload production process fully or partly to smaller companies equipped with computerised production methods. Thus, subcontracting relations may persist after all in so far as larger firms can flexibly automate their core processes and maintain links with flexibly automated small firms.

Subcontracting as a means to several ends for parent firms

Larger firms derive their discretionary power from their subcontracting relations with smaller firms in a number of ways. We found that large firms can overcome their capacity or space constraints through subcontracting. Most frequently, large firms can reduce their overall fixed and variable costs through subcontracting and purchasing and thereby reduce the rates of capacity utilisation at which break-even can happen. Here it must be noted that if the factory cost (i.e. prime cost plus factory overhead) is less than the procurement price for the same quality and if future demands are significant, large firms may find it better to make rather than buy, ceteris paribus. Large firms can also resolve the problem of high prime and transport costs arising from a particular disadvantageous geographical location by subcontracting the whole production in the final markets or nearer to areas of market growth.

Frequently, firms find it economic to subcontract to outside parties possessing special knowledge, equipment or a patented process than to procure special equipments and knowledge to train personnel in order to handle the work or license the process. Large firms can achieve risk-spreading via subcontracting; they can spread the costs of constant retooling, rejuvenation and innovation in the context of technological change and short life-cycles. Further, subcontracting can be used as a stop-gap arrangement so as to modernise present facilities or set up new lines and get rid of the old lines of production. Thus, since modernisation process can set in along with the phasing our of the erstwhile lines and methods, subcontracting is an eminent way of creative destruction.

Lastly, large firms can gain in numerous ways as captured by the elastic category, flexibility, which outweigh the organisational difficulties of subcontracting. Multiple sources of supply guarantee timely procurement to meet delivery schedules. They also supply competitive pressure on the subcontractors. In the context of demand instability, especially in depressed times, the burden of adjustments can be shifted to subcontractors. Subcontracting can debilitate the bargaining strength of unionised labour. Large firms could at the most concede organised labour wage increases only against committments on productivity. Thus, subcontracting gives firms flexibility in redefining their wage strategy and over their responses to the spectre of unionism.[4]

The geographical dispersal of subcontractors no doubt increases transport costs but in the calculus of some firms, this may well be offset by the industrial peace attained due to such fragmentation of work and workforce. We may safely say that flexibility is the most important criterion for many firms in their 'make-buy' decision.

Impact of subcontracting relationship on subcontractors

We argued that whether or not subcontracting ultimately facilitates the development of the takers of subcontract is a function of the terms and conditions set and how they are actually implemented or violated by the givers of subcontract on the one hand and of the capabilities of the subcontractors themselves to overcome their own labour, product, process and market specificities/inflexibilities. Usually, the adjustment costs of changes effected at the parent firms are passed on to the subcontractors to the

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4. Jairus Banaji, op.cit.

latter's disadvantage and even collapse, especially in recessionary times. Thus, subcontracting relationship, although appears to be based on mutual interests, is largely unsymbiotic as far as the takers of subcontract are concerned. The relationship is ultimately beneficial to larger firms. This is illustrated by our empirical analysis of Keltron's TV operations and of the experiences of Keltron's TV subcontractors.

The case study brought out that although Keltron took advantage of differentials in hourly overhead and labour costs through industrial subcontracting, its capacity to penetrate the markets in the country was rather weak due to not only aggressive price competition but also non-price competition from many other TV manufacturers.

Keltron's TV production level itself was rather insignificant. The actual production more often failed to hit the targets and tended to fluctuate due to supply-sided problems such as picture tube availability, low labour productivity and the 'labour problem' in general vis-a-vis the demand-side changes such as growth of broadcasting infrastructure and volatile consumer preferences.

TV production in general is material and component intensive. Nearly 80 per cent of an average TV set's total works cost is accounted by various materials and components. Given this fact, it was observed that Keltron's

TV factory suffered from high costs of sourcing inputs from far off places outside the State apart from high costs of shipping the finished product to distant markets. The cost of input sourcing could not be minimised because of the specificity of Kerala's industrial base itself. It is lop-sided towards resource-based industries so much so that the agglomeration economies are very poor. Consequently the development of viable supporting ancillary industries is marginal. The lack of agglomeration economies affected the existing large firms as also ancillary firms in modern industries.

Given the low volume of production and low offtake in the markets, Keltron restructured its TV operations in many ways. It embarked on diversification towards relatively low-cost colour TV manufacture. It shifted its focus away from its own manufacture to commercial subcontracting to suppliers in areas of market growth. This seemed to increase its profitability and market penetration in regard to black and white TV production. Keltron also effected low-cost rationalisation through technological change in terms of simplification of the design structure of its TV sets.

Given the low volume of production and low offtake problem and the above changes affected in order to overcome the crisis, most of the subcontractors experienced sub-optimal and irregular and even loss of work orders, operational problems such as delay of payments, high inventory holding costs, costs of adjusting to changes in production-mix of the parent firm, etc. In this precarious milieu that was further worsened by ruthless competition between the subcontractors themselves, the subcontractors who could withstand thepressures seemed to be those who were neither product specific nor market specific. In other words, diversification of products/operations and clientele in extremely important for the survival and viability of subcontractors.

We may also state in conclusion that it was thought while forming Keltron that the establishment of chains of subcontracting based on electronics would lead to rapid decentralized industrialisation in Kerala. Our study clearly points out the limits of such a strategy in a region where large firms in engineering and electronics are fewer, and in a business environment structured by competitive and unequal power relations between firms.

APPENDIX 1

List A : Projects directly undertaken and planned by KSEDC

Project	Year of commercial production	Product(s)	know-how (imported/ own R & D/ indigenous	Sales Destination(Inter-company/, domestic market for exports)
(1)	(2)	(3)	(4)	(5)
1.Television at Keltron equipment complex, Karakulam, Trivandrum	1974	monochrome & colour sets	indigenous/ own R & D	domestic market
2.TV systems or Mass communications Division (MCD) at Keltron equipment complex (KEC), Karakulam,		CCTV (close circuit TV) systems, TV studio equipment, TV mointor, TV Cameras, TV exciter, TV transmitters, Direct reception systems, Radio net work terminals, miniature Walkie-talkie		domestic market
3.Digital electronics at KEC, Karakulam.		Calculators, Cash registers, weigh bridge, display for weigh scales, card attendance system, printers, ticket printing machines for weigh scales, under frequency relays, control unit for weigh bridges, line frequency monitors, master clock systems and control unit for master clocks, impulse clock systems (digital display), punch clock system, Alpha numeric display system.		domestic/export

(1)	(2)	(3)	(4)	(5)
4. Industrial Electronics at KEC, Karakulam.		Variable spped drives, high capacity drives & others, static invertor systems (various uninterruptible power supply systems), voltage stabilizers (conventional), servo-controlled voltage stabilizers (SCVS), Battery chargers, rectifier equipment and power plants, high current thyristor rectifiers, single phase and 3-phase thyristor convertors, constant current controllers, high voltage rectifiers (for electronic precipitators) and other custom-built equipment.		domestic
5. Control Instrumentation at Keltron Controls, Aroor, Alleppey	1981-'82	electronic process control instruments	imported	domestic
6. Printed circuit Boards (PCBs) (separate factory)	1983	PCBs for consumer electronics and PCBs for professional electronics.		inter-company, domestic & exports
7. Metalized die-electric film (separate factory)		Processed material for plastic film capacitor industry		domestic
8. Control valves (separate factory)	1983-'84	Valves for control instruments	imported	

(1)	(2)	(3)	(4)	(5)
9. Analytical instruments & data acquisition systems at Keltron Controls			imported	domestic
10.Computers at KEC, Karakulam		Micro-processor based systems, temperature scanners, semi-conductor based annuciation systems	own R & D	domestic
11.Telecommunication (separate factory)		telephone instruments (dial type & push-button type),digital multiplexing equipment, electronic rural automatic exchanges	imported	domestic
12.Assembly of Electronic watches (at new plant or Keltron Crystals Ltd.)	1984	Watches based on imported quartz modules, cases etc.		domestic & export
13.Medical electronics		medical instruments	own R & D	domestic
14.chips		very large-scale ICs like 64K,256K RAM(random access memory)chips	imported	domestic
15.VCRs & Colour TV sets (separate plant)		Video Cassette recorders and color TV sets	imported	domestic & export

List B : Projects undertaken by companies incorporated by KSEDC

Project	inception	Trial/ commercial production	Products	know-how	destination
(1)	(2)	(3)	(4)	(5)	(6)
1.Keltron Crystals Ltd. (subsidiary)	1974	1977	Piezo-electric crystals or quartz crystals		domestic & export
2.Keltron Magnetics Ltd.(Subsidiary)	1975	1977	Assembly of electromagnetic components, electronic subassemblies and Color TV delay lines, servo-controlled voltage stabilizers.		inter-co. & domestic & export
3.Keltron power Devices Ltd.(subsidiary)	1976	1977-'78	Assembly of silicon power transistors		inter-Co. & domestic.
4.Keltron Rectifiers Ltd.(subsidiary)	1976	1977-'78	Silicon rectifiers and diodes		inter-company & domestic.
5.Dielectro Magnetics Ltd.(subsidiary)	1974	1977	Ceramic Capacitors		inter-company & domestic
6.Keltron Counters Ltd. (Subsidiary)	1974		various counting mechanisms and other items (like speedometers, loudspeakers, voltage stabilizers, impulse clocks, DC and AC motors, maintenance items for defence, transmitters etc.		domestic

(1)	(2)	(3)	(4)	(5)	(6)
7.Keltron Resistors Ltd.(sub-sidiary)	1975		Carbon film and metal film resis-tors		inter-Co. & domestic
8.Keltron component complex Ltd.	1974		Electrolylithic and monolithic capa-citors	imported	domestic/ export
9.Keltron Ferrites Pvt.Ltd.	1975		Industrial ferri-tes		domestic
10.Keltron varistors Pvt.Ltd. (closed)			thermistors & varistors		domestic
11.Keltron projectors Ltd.	1975	1976	8MM & 16 MM projectors, multi point recorders, Traverse indicator recorder,traverse indi-cator transmitter.		domestic
12.Keltron Entertain-ment Systems Ltd.	1975		Low-cost 2-band sets, 3 and 4-band radios, Public address systems, stereo amplifiers, auto cassette player, stereo cassettes,decks, stereo tape deck with speakers, clock radio, economy model radio, mono cassette recorder, road traffic signal controllers & profess-ional equipments etc.		domestic

APPENDIX 2

Table 1

Characteristics and ranks of the sample units

S.No.	Subcontractor/ ancillary type	Age (yrs)	Rank	Size (employees)	Size (fixed capital value) in Rs	Rank	Extent of (source) diversification	Rank
1	S_1	2.5	(6.5)	5	0	(1.5)	0	(4)
2	S_2	5	(16)	51	1,500	(3)	0	(4)
3	S_3	2	(5)	4	5,500	(4)	0	(4)
4	S_4	4	(12)	5	6,000	(5)	0	(4)
5	S_5	6	(19.5)	26	50,000	(19)	1	(12.5)
6	S_6	1.5	(4)	2	0	(1.5)	0	(4)
7	S_7	4	(12)	10	15,000	(7.5)	1	(12.5)
8	E_1	1	(2)	8	35,000	(16)	1	(12.5)
9	E_2	4	(12)	4	75,000	(20)	1	(12.5)
10	E_3	3	(9)	12	48,000	(18)	2	(19.5)
11	E_4	3	(9)	7	19,000	(11)	0	(4)
12	M_1	9	(23.5)	6	7,00,000	(27)	2	(19.5)
13	M_2	5	(16)	22	2,25,000	(24)	3	(23.5)
14	P_1	5	(16)	4	17,000	(10)	5	(26)
15	P_2	10	(26.5)	3	15,000	(7.5)	2	(19.5)
16	P_3	2.5	(6.5)	4	15,000	(7.5)	2	(19.5)
17	P_4	1	(2)	12	15,000	(7.5)	3	(23.5)
18	P_5	10	(26.5)	10	2,50,000	(25)	1	(12.5)
19	P_6	9	(23.5)	5	40,000	(17)	3	(23.5)
20	P_7	11	(28)	60	20,00,000	(28)	11	(28)
21	P_8	3	(9)	8	1,25,000	(22)	3	(23.5)
22	C_1	9	(23.5)	16	5,00,000	(26)	10	(27)
23	V_1	5	(16)	20	30,000	(14.5)	0	(4)
24	V_2	6	(19.5)	32	30,000	(14.5)	1	(12.5)
25	V_3	5	(16)	11	28,000	(13)	1	(12.5)
26	V_4	1	(2)	14	25,000	(12)	1	(12.5)
27	V_5	9	(23.5)	15	1,50,000	(23)	1	(12.5)
28	V_6	7	(21)	40	1,00,000	(21)	1	(12.5)

Note (a) Units S_1 to S_7 are subassembly units; E_1 to E_4 are electrical units; M_1 and M_2 are mechanical units; P_1 to P_8 are plastic units; C_1 is carton & fitment unit; V_1 to V_6 are TV cabinet units.

(b) from lowest to highest; Ties in the observations are handled by averaging the ranks that would have been assigned to the tied observations and assigning this average to each.

APPENDIX 2

Table 2

Materials Management by electrical units

Unit	Sourcing of rawmaterials etc.
T_1	Plastic formers, lamination from GK&W, Bombay for driver transformers copper wire from Madras for driver transformers and radio coils.
T_2	Plastic formers, sleeves, laminations, copperwire, bobbin, clamp, varnish, bakelite, different types (in terms of thickness) of glass paper, P.V.C. wire etc. from Bombay, Bangalore and Madras.
T_3	Laminators from GK&W(Guest Keen and Williams Ltd.), Bombay (as suggested by KEC), copper wire, insulating varnish, relay, transistors etc. from Delhi, Madras and Bangalore
T_4	Laminations, copper wire, bobbins, group board (for connecting),clamps, screws, nuts, washers etc. from Bombay and Madras.

APPENDIX 2

Table 3

Materials Management by Plastic Units

Plastic Unit	Rawmaterials etc. procured	Source
P_1	PVC(Polyvenyl Chloride Plastics) Brass Pins, Cables	Bombay, Delhi and Calcutta
P_2	High Density Polythene(HDPE) Low Density Polythene(LDPE) Polypropalyne, Styron, Nylon	Bangalore, Bombay, Delhi and Madras.
P_3	Plastic grannules, foam leather Solution(Cement x), gum etc.	Madras
P_4	Polypropelyne, High Impact Polythene, Styron, High Impact Polystyron (low and high densities)	Madras
P_5	Polythene(low density and high density) Nylon, high impact styron, Deldrin etc.	Madras
P_6	Plastic grannules, Polythene (HD & LD) High Impact Styron Rubber	Madras and Bangalore
P_7	Polystyrene, Polypropelene, Polycarbonate etc.	Madras, Bangalore and Bombay
P_8	Plastic granules Sheet metal foam leather	Madras local agents local agents

APPENDIX 2

Table 4

Materials Management by Packaging Unit

Unit	Procurement of Rawmaterials etc.	Source
	I Paper	
Carton & fitment	(i) A Grade Virgin Paper (high density)	Seshasayi Paper Mills, Salem, Orient Paper Mills, Orissa Sirpur (A.P) and Punalur Paper Mill
	(ii) B Grade Non-Virgin Paper (low quality)	Sri Ram Paper Mills, Surat Wood Paper, Surat ; Balakrishna Paper, Bombay
	II Stitching wire	Pearl Products, Bombay; Hindustan Wire Products, Bombay; Deco Stitching Wire, Bombay.
	III Gum	Corn Products, Bombay

APPENDIX 2

Table 5

Wage rates at 23 sample units

Subcontractor	Daily wage rates of							
	Skilled (Rs)	Unskilled (Rs)	Helper (Rs)	Trainee (Rs)	Instructor/ Supervisor/ Foreman (Rs)	Storekeeper/ Clerical/ (typist) (Rs)	Manager/ Director (Rs)	Casual (Rs)
S_2	-	2.5	-	-	4	-	-	-
S_4	9	8.5	-	-	-	-	-	-
S_5	-	12.5	-	-	13	10	-	-
S_6	-	3	-	-	-	-	-	-
T_2	8	5	-	-	-	-	-	-
T_3	11	5	-	-	17	-	-	-
M_1	20	5	-	-	-	-	-	-
M_2	23	4	-	-	-	-	-	-
P_1	20	9	-	-	-	-	-	-
P_2	10	7.5	-	-	-	-	-	-
P_3	7	-	5	-	-	-	-	-
P_4	18	12	-	5	-	-	-	-
P_5	15	5	-	-	-	-	-	-
P_6	10	6	-	-	-	-	-	-
P_7	22	15	-	-	31	31	52	16
P_8	11	-	8	6	-	-	-	-
C_1	9	6	5	-	20	15	-	-
V_1	17.5	-	-	-	-	-	-	-
V_2	23	8	2	-	-	-	-	-
V_3	25	13	-	1.45	-	-	-	-
V_4	13	6	-	-	-	-	-	-
V_5	22	13	-	7	-	-	-	-
V_6	21	13	-	7.5	-	-	-	-

Note 1: The training period varied between the 8 units which reported from a minimum of 3 months to a maximum of 2 years.

APPENDIX 2

Table 6

Daily wage rates at KEC(TV)

S.No.	Designation	Grade[a] (Rs)	Daily wage rate[b] (Rs)
1.	Helper-II, Unskilled operator	240-6-270-7-340	18.07
2.	Helper-I, Operator III, Semi-skilled operator	275-8-315-9-360	19.84
3.	Sr.Helper, Operator II, Skilled operator - A	325-10-375-11-452	22.21
4.	Operator-I, Typist I, Asst.II, Steno-II, Cost Asst.I, Stores Asst.II	355-12-415-13-506	23.79
5.	Senior operator, Stores Asst.I, Sr.Cost Asst.II, Stores Asst.I, Sr.Typist-B, Sr.Cost Asst.II, Asst.I, Steno-I	440-15-515-17-685	27.73
6.	Highly skilled technician-II, Sr.Stores Asst., Senior Cost Asst-I, Sr.Typist-A, Sr.Asst.II, Sr.Steno-II (P.A.II)	525-18-615-20-815	31.68
7.	Highly skilled Technician-I, Sr.Asst.-I, Sr.Steno I, P.A -I	600-20-700-22-920	35.03
8.	Master Technician	645-25-1020	
9.	Asst.Engineer	770 plus	
10.	Deputy Engineer	800 plus	
11.	Sr.Engineer	950 plus	
12.	Asst.Manager	1250 plus	
13.	Dy.Manager	1450 plus	
14.	Manager	1550 plus	
15.	Sr.Manager	1750 plus	
16.	General Manager	2100 plus	

Note: a. The grade is read as follows, for eg., Basic 240 + increment of Rs.6 per annum for 5 years = Next slab Basic 270 (240+30) + increment of Rs.7 for 10 years = Rs.340(270+70) by the end of 15 years.

b. Daily wage rate is computed as follows. First, we have taken the 5-year-end Basic since the average age of subcontractors is 5 years. Secondly, monthly wage rate is obtained as follows: 5-year-end Basic + Variable D.A. of 200 + special allowance of 6 + 1/12 x (Annual bonus of 8.33% on 12 x (5-year-end basic+variable DA)).Daily rate is obtained by dividing monthly rate by 30.

c. Workers get variable DA according to the long-time agreement between trade unions and management

d. Supervisors and Executives get fixed(state)D.A.of Rs.250

e. All employees get P.F.

f. Employees receiving below Rs.1000 monthly payment get ESI and those receiving more than Rs.1000 monthly payment get company medical benefits.

Source: Personnel Department, Keltron Equipment Complex, Feb.1984.

B I B L I O G R A P H Y

A Group of Researchers (1986) : 'Contract Labour in a Steel Plant : A study for a Trade Union', EPW, November.

Aaronovitch, Sam (1977): 'The Firm and Concentration', in Francis Green & Petter Nore (ed.), Economics An Anti-Text, MacMillan.

Abegglen, James C and Etori, Akio (1982): 'Japanese Technology Today', Scientific American, Vol.247, No.4, October.

Adem, Gyorgy (1975) : 'Multinational Corporations and Worldwide Sourcing', in Hugo Radice (ed.), International Firms and Modern Imperialism, Penguin.

Aglietta, Michel (1979): A Theory of Capitalist Regulation The US Experience, New Left Books.

AIEI (1979) : Background Paper on Electronics Industry Workshop on Electronics Association of Indian Engineering Industry, February 7th.

Alam, Gheyyur (1981) : Performance of Imported Technology in LDCs - The Case of the Telephone Industry in India, NCAER, New Delhi.

Albus, James S and Evans Jr, John M (1976) :'Robot Systems' Scientific American, vol.234, No.2, February.

Allen, Sheila (1985) : 'The Labor Process and Working at Home', Social Scientist 149-150, October-November.

Allen, Sheila and Wolkowitz, Carol (1986): 'The Control of Women's Labour: The Case of Homeworking', Feminist Review, No.22, Spring.

Amsden, Alice H. (1985): 'The division of labour is limited by the rate of growth of the market: the Taiwan machine tool industry in the 1970s', Cambridge Journal of Economics, Vol.9, No.3, September.

Anantharaman, S.C.(1980): 'The Match Makers of Sivakasi' (parts 1-5), Business Standard, March 7,8,10,11 & 12.

Anell, Lars (1981): Recession the Western Economics and the Changing World Order, Frances Pinter Ltd.,London.

APO (1964) : Symposium on Small Business Development, Papers presented:Vol I, Asian Productivity Organisation Project SYP/I/64, 9th-16th November, Tokyo.

APO (1971) : Industrial Engineering and Technology, Tokyo.

APO (1978) : International Sub-contracting : A Tool of Technology Transfer, Tokyo.

Arrigo, Linda Gail (1980): 'The Industrial Workforce of Young Women in Taiwan', Bulletin of Concerned Asian Scholars, Vol.12, No.2, April - June.

AWDI - FES (1983) : The State of Unorganized Labour(Seminar), Asian Workers Development Institute, Rourkela, February 24 - 27.

Bailes, Kendall E (1977): 'Alexic Gaster and the Soviet Controversy over Taylorism 1918-24', Soviet Studies, Vol XXIX, No.3, July.

Ballance, Robert and Sinclair, Stuart (1983): Collapse and Survival : Industry Strategies in a Changing World (World Industry Studies :1), George Allen & Unwin,London.

Banaji, Jairus (1980): Accumulation and Exploitability - Some Notes for a Study of Industrial Capitalism in India, Bombay (mimeo).

Banerjee, Nirmala (1981) : 'Is Small Beautiful ?' in Bagchi, A.K. & Nirmala Banerjee (ed.), Change & Choice in Indian Industry, CSSS, Calcutta.

Bannock, G et al (1972) : A Dictionary of Economics, Penguin.

Bannock, Graham (1981) : The Economics of Small Firms Return from the Wilderness, Basil Blackwell, Oxford.

Barker, Jane (1981) : New Technology Pack, Centre for Alternative Industrial and Technological Systems, Polytechnic of North, London.

Bartee, Thomas (1981) : Introduction to Computer Science, McGraw - Hill International Book Co.

Basu, S.K., Alak Ghosh and Subrata Ray (1965) : Problems and Possibilities of ancillary industries in a developing economy, A Study based on the Survey of Ancillary Units in West Bengal, The World Press Pvt.Ltd., Calcutta.

Basu, Timir (1977) : 'Calcutta's Sandal Makers', EPW August 6.

BCCI (1979) : Role of Organized Industry in the effective development of Small Scale Industry, Proceedings & Background papers of the Seminar held on February 8, Bombay Chamber of Commerce & Industry.

Bell, John (1984) : 'Car Makers shy from the Polymer gamble', New Scientist, No.1413, 7th June.

Berg, Maxine (1979) : Technology & Toil in Nineteenth Century Britain (Documents edited), CSE Books, London.

Bhagat, Mukarram (1981) : Aspects of Drug Industry in India, Centre for Education and Documentation.

Bhanot, Balraj (1976): 'Profile of Electronics Industry in India', Electronics, Information & Planning, Vol.4,No.3, December.

Bhardwaj, Krishna (1979) : 'Towards a Macroeconomic framework for a developing economy : The Indian case', The Manchester School of Economic and Social Studies, Vol.47, No.3, September.

Bhat, V.V. (1978) : 'Decision Making in the Public Sector: Case Study of Swaraj Tractor', EPW , Vol.XIII, No.21, May 27.

Bhattacharya, Aditya (1980) : 'Small,Large Industries Concept of Economic Federalism', Economic Times, 30 October.

Bhattacharjea, Sibnath (1980) : Rural Industrialization in India, B.R.Publishing Corporation, Delhi.

Bhushan, Bharat (1982) : Technology and Work organisation in Indian Electrical Engineering Industry, Ph.D. Thesis submitted to the University of London and for the Diploma of Membership of the Imperial College, Dept.of Social and Economic Studies, Imperial College, London, S.W.7,September.

Bhushan, Bharat (1984) : 'Ancillarization : A New production Strategy', Business India, January 16-19.

Black, J.T. (1983) : 'Cellular Manufacturing Systems reduce set up time, make small lot production economical', Industrial Engineering, Vol.15, No.11, November.

Blecher, Marc (1983) : 'Peasant Labor for Urban Industry: Temporary Contract Labor, Urban-Rural balance and Class relations in a Chinese County', World Development, Vol.11, No.8.

Blois, K.J. (1972) : 'Vertical Quasi - Integration ', Journal of Industrial Economics, Vol.20, No.3, July.

Boraiko, Allen A (1982) : 'Electronic Mini Marvel : The Chip', National Geographic, October

Bose, A.N. (1978) : Calcutta and Rural Bengal: Small Sector Symbiosis, (A WEP study for ILO), Minerva Associates, Calcutta.

Boswell, Jonathan (1972) : The Rise and Decline of Small Firms, George Allen & Unwin Ltd., London.

Braverman, Harry (1974) : Labour and Monopoly Capital, The Degradation of Work in the Twentieth Century, Monthly Review Press.

Brecher, Jeremy (1979) : 'Roots of Power: Employers and Workers in the Electrical Products Industry', in Andrew Zimbalist (ed.), Case Studies in the Labour Process, Monthly Review Press.

Bright, James R (1958): Automation and Management, Division of Research, Graduate School of Business Administration, Harward University, Boston.

Bromley, Ray and Gerry, Chris (ed.) (1979): Casual Work and Poverty in Third World Countries, John Wiley & Sons Ltd.

Brown, Andrew C. (1986) : 'Unilever fights back in the US', Fortune International, May 26.

Bruno, Sergio (1979) : 'The Industrial reserve army, segmentation and the Italian labor market', Cambridge Journal of Economics, Vol.3.

Brusco, Sebastiano (1982) : 'The Emilien Model : Productive Decentralisation and Social Integration', Cambridge Journal of Economics, Vol.6, No.2. June.

Buttrick, John (1952) : 'The Inside Contract System', The Journal of Economic History, Vol. XII, No.3, Summer.

Bylinsky, Gene (1986) : 'A Breakthrough in automating assembly line', Fortune International, May 26.

Bylinsky, Gene (1986) : 'The High Tech Race Who's Ahead?', Fortune International, October 13.

Cable, Vincent & Weston, Ann (1983) : Indian Handicrafts and Handlooms -- Production for the World Market, ICRIER, New Delhi, October.

Campos, Ricardo and Frank Bonilla (1982) : 'Bootstraps and Enterprise Zones: The Underside of Late Capitalism in Puerto Rico and the United States', Review, Vol.5, No.4, Spring.

Cartillier, Michel (1975) : Role of Small-Scale Industries in Economic Development Irrigation Pumpsets Industry in Coimbatore', EPW, November 1.

Caves, Richard E and Uckusa, Masu (1976): Industrial Organization in Japan, The Brookings Institution, Washington D.C.

CAW - URM (1984) : Our Rightful Share, Committee for Asian Women and Urban Rural Mission. Christian Conference of Asia Hongkong.

CCA-URM (1982) : The Plight of Asian Workers in Electronics, Hong Kong, October.

Chakravarty, Nitish (1982): 'The Automobile Industry', The Hindu, August 24.

Chopra, R.C. (1976) : 'Current Status and Growth Prospects of TV Industry in India', Electronics, Information & Planning, Vol.3, No.6, March.

Chopra, L.C. and S.L.Sarnot (1976): 'Low-Cost Television Receivers', Electronics, Information and Planning, Vol.3, No.7, April.

Chopra, R.C. (1980) : 'Current Status, Problems and Growth Prospects of TV Industry', Electronics Today, Vol.13, No.2, February.

Chopra, R.C & S.L.Sarnot (1980):'Small Scale Sector in Electronics: Appraisal, Prospects and Policies', Electronics, Information & Planning, Vol.8, No.2, November.

Chopra, R.C. (1984) : Small Sector in Electronics in India, in Electronics Conference and Exhibition, Ahmedabad.

Chowla, N.R. (1983) : 'Television Expansion Plan-I', Financial Express, September 6.

Chudnovsky, Daniel et al (1983): Capital Goods Production in the Third World. An Economic Study of Technical Acquisition, Frances Pinter, London.

Clark, Rodney (1979) : The Japanese Company, Yale University Press New Haven & London.

Clews, G and Leonard, R (1985) : Technology and Production, Industrial Studies Series, Heritage Publishers, New Delhi.

Coase, R.H. (1937) : 'The Nature of the Firm', Economica, November.

Cook, Nathan H (1975) : 'Computer-managed parts manufacture', Scientific American, Vol.235, No.2. February.

Cooper, Richard N (1972) : 'The European Community's System of Generalized Tariff Preferences: A Critique', The Journal of Development Studies, Vol.8, No.4, July.

Coopola, Pasquale (1986) : 'Industrialization North of Naples: Problems of Sectoral and Spatial Connectivity', in F.E.Ian Hamilton (ed.), Industrialization in Developing and Peripheral Regions, Croom Helm.

Coriot, Benjamin (1980) : 'The Restructuring of the Assembly Line : A New Economy of Time and Control', Capital & Class 11, Summer.

Danjo, Kunio and Sonoda, Ricchi (1971) : Improving Management in Process, Parts and Manufacturing Industries, Technical Publications, Asian Productivity Organisation, April.

Dankbaar, Ben (1984) : 'Maturity and Relocation in the Car Industry', Development and Change, Vol.15, No.2, April.

Datta, Bhabhatosh (1978) : 'Small is Big : A Critique of the Industrial Policy Statement', EPW Vol.13, No.3.January 21.

Deodhar, Prabhu and Prakash Vaidya (1978): 'Electronics Industry in India', Electronics Today , Vol.11,No.5,May.

Desai, Ashok V(1982) : Market Structure and Technology : Their Interdependence in Indian Industry, NCAER, August.

Desai, Ashok V. (1983) : New Forms of International Investment in India, National Council of Applied Economic Research, January, New Delhi.

Djao, A Wei (1981) : 'Traditional Chinese Culture in the Small Factory of Hong Kong', Journal of Contemporary Asia, Vol.11, No.4.

Dobb, Maurice (1963) : Studies in the Development of Capitalism. Routledge & Kegan Paul, London.

Dokopoulou, Evangelia (1986) : 'Foreign Manufacturing Investment in Greece, Competition and Market Structure' and 'Multinationals and Manufactural Exports from the enlarged EEC Periphery : The Case of Greece', in F.E.Ian Hamilton(ed). op.cit.

Downs, Peter (1981) : 'Computers Replace Machinists Technology and Productivity', Science for the People, Vol.13, No.1, January - February.

Drabu, Haseeb (no date) : Status of the Drug Industry in India : Report on a Seminar, CDS (mimeo)

Dreyfuss, Joel (1986) : ' Japan's Comeback Plan', Fortune International, Sept.29.

Duchi, Genevieve and Suzane Savey (1987) : 'The Rising Importance of Small and Medium - Sized Firms : Towards a New Industrial System', in F.E.Ian Hamilton (ed.), Industrial Change in Advanced Economies, Croom Helm.

Duncan, Mike (1981) : 'Micro electronics: Five Areas of Subordination', in Levidow, Les & Bob Young (ed). Science Technology and the Labor Process, CSE Books.

Earl, Peter (1984) : The Corporate Imagination, M.E.Sharpe, Inc. Armonk, New York.

Eisold, Elizabeth (1984) : Young Women Workers in Export Industries: The Case of the Semiconductor Industry in Southeast Asia, WEP/WP.301 ILO, Geneva, March.

Elbaum, Bernard and Wilkinson, Frank (1979) : 'Industrial Relations and Uneven Development : A Comparative Study of the American and British Steel Industries', Cambridge Journal of Economics, Vol.3.

ELCINA (1983) : Indian Electronics Directory 1982-83.

Ellegard, Kajsa & Claes Alvstam (1987) : 'People-Production-International Division of Labour', in F.E.Ian Hamilton(ed). op.cit.

Emspak, Frank (1980) : ' Labor Process and Capitalist Corporate Planning', Science & Society Vol.XLIV, No.2, Summer.

Ernst, Dieter (1981) : Restructuring World Industry in a Period of Crisis - The Role of Innovation. An analysis of Recent Developments in the Semiconductor Industry, UNIDO Working Paper on Structural changes; prepared by the Global and Conceptual Branch Division for Industrial Studies; UNIDO/IS 285, 17th December.

Ernst, Dieter (1986) : Automation, Employment and Third World Case of Electronics Industry', The Economic and Political Weekly, Vol.XXI, No.28, July 12.

ESCAP (1979) : Re-orientation of Industrial Policies, Ad-hoc Group of Ministers of Industry, Bangkok.

ESCAP (1979) : Transnational Corporations in the Consumer Electronics Industry of Developing ESCAP Countries, Joint CTC/ESCAP Unit on Transnational Corporations Working Paper, No.5, Bangkok, January.

Etsuko, Kaji (1973) : 'The Invisible Proletariat : Working Women in Japan', Ampo Japan-Asia Quarterly Review No.18, Autumn.

Evers, B and Pronk, J (1983) : Restructuring Policy of the European Community, Paper prepared for the IERC - ICRIER Conference on "Rethinking Global Negotiations", January 6-8, New Delhi.

F.D. Stewart Pvt.Ltd. (1983) : Study Amongst Keltron TV Owners in Madras City, July.

FEII (1978): Seminar on Marketing Strategy for Small Engineering Industries (Proceedings), 20th September, New Delhi.

Fell, Arthur M (1981) : ' A Profile of the Small Business Sector in France'. American Journal of Small Business, Vol.VI, No.2, October-December.

FICCI (1967) : Industrial Recession : Causes and Cures, (mimeo)

FICCI (1970) : Report on Seminar on Prosperity through Balanced Industrial Development, 5th February, New Delhi.

FICCI (1981) : Workshop on Ancillarization (Proceedings & Background papers), July 8, New Delhi.

Finger, J.M. (1975) : 'Tariff Provisions for Offshore assembly and the Expôrts of developing countries', The Economic Journal, Vol.85, June.

Frank, Andre Gunder (1979) : 'Unequal Competition, Intermediate, Semi-peripheral and Sub-imperialist Economies', Review, No.3, Winter.

Friedman, Andrew (1977) : Industry & Labour Class Struggle at Work and Monopoly Capitalism, MacMillan, London.

Frobel, Folker et al (1976) : 'Tendency towards a New International Division of Labor', EPW, Annual No.

Frobel, Folker, Heinrichs, Turgen and Kreye, Otto (1980): The New International Division of Labor, Cambridge University Press.

Gabriele, Jean-Paul (1986) : ' Industry in Hante Marne : A Rural Backwater in an Advanced Economy', in F.E.Ian Hamilton (ed.), Industrialization in Developing and Peripheral Regions, Croom Helm.

Gadgil, D.R. (1971) : The Industrial Evolution of India in Recent Times 1860 - 1939, Oxford University Press.

Gartman, David (1979) : 'Origins of the Assembly line and capitalist control of work at Ford', in Andrew Zimbalist (ed), Case Studies on the Labor Process, MRP.

Germidis, Dimitri (ed.) (1980) : International Subcontracting A New Form of Investment, Development Centre of the Organisation for Economic Co-operation and Development. Paris.

Glaberman, Martin (1981) : 'Let the Capitalists fight the car wars US Auto workers visit Japan', Ampo Japan-Asia Quarterly Review, Vol.13, No.1.

Godfrey, Martin (no date) : International Migration and Women, Institute of Development Studies, University of Sussex (mimeo).

Gopalakrishnan, P (1983) : 'Spare Control for Cost Reduction', The Hindu, July 8

Gordon, David L (1979) : 'The Bank and the Development of Small Enterprises', Finance & Development, Vol.16,No.1,March.

Govt.of Kerala (no date) : Examination of the Working of KSEDC by Public Undertakings Committee, (Available at Keltron)

Govt.of India (1963) : Third Five Year Plan: Progress Report 1961-62, Planning Commission.

Goyal, S.K, K.S.Chalapati Rao, & Nagesh Kumar (1984) : Small Scale Sector and Big Business, Corporate Studies Group. The Indian Institute of Public Administration, New Delhi, February.

Gregory, Gene (1982) : The Japanese Propensity for Innovation : Electronics, Institute of Comparative Culture Business Bulletin No.86, Sophia University, Tokyo.

Grossman, Rachel (1979-80) : 'Women's Place in the Integrated Circuit in Malaysian Electronics Factories', Manushi, December-January.

Gunn, Thomas G (1982) : 'The Mechanization of Design and Manufacturing', Scientific American, Vol.247, No.3, September.

Harris, John (1982) : 'Character of an Urban Economy -"Small Scale" production and labor markets in Coimbatore' (Part 1&2), EPW, June 5 & 12.

Haruo, Sono (1981) : 'Japanese Automotive Capital & International Competition', Ampo Japan-Asia Quarterly Review, Vol.13,Part 1 in No.1, & Part 2 in No.2

Hawthrone, Edward P (1978) : The Management of Technology, McGraw-Hill Book Co.(UK)Ltd.

Helleiner, G.K. (1972) : 'Manufactured Exports from less-developed countries and multinational firms', The Economic Journal, March

Helleiner, G.K. (1976) : 'Transnational Enterprise, Manufactured Exports and Employment in Less Developed Countries', EPW, Annual No. February

Helleiner, G.K. (1981) : 'Intra-firm trade and the developing countries: An assessment of data', in Murray, Robin (ed), Multinationals Beyond the Market, Press.

Herzog, Helge (1982) : 'Small and Medium-Size Firms in Sweden and Govt.Policy', American Journal of Small Business, Vol.7, No.2,October-December.

Herzog, Marianne (1980) : From Hand to Mouth Women and Piecework (Introduction by Sally Alexander),Penguin Books.

Hill, Hall (1985) : 'Subcontracting, Technological Diffusion and the Development of Small Enterprise in Philippine Manufacturing', The Journal of Developing Areas, Vol.19,No.2, January.

Hirachand, Lalchand (1973) :'Automobile Industry in India', The Illustrated Weekly of India, May 27.

Hiroshi, Inose (1983) : 'Microelectronics Technology: All-encompassing & Profound', The Hindu, November 8.

Hirschmeier, Johannes and Yui, Tsunehiko (1975): The Development of Japanese Business, George Allen & Unwin Ltd. London.

Ho, Sam P.S. (1980) : Small-Scale Enterprises in Korea and Taiwan, World Bank Staff Working Paper No.384.

Hobsbawm, E.J. (1964) : Labouring Men Studies in the History of Labour, Widenfeld and Nicolson, London.

Hoselitz, Bert (ed) (1968) : The Role of Small Industry in the Process of Economic Growth, Monton, The Hague/Paris

Ibbetson, J.P.R. (1980) : 'Volvo revisited', Work Study, Vol.29, No.1, January.

IBRD (1972) : Small Scale Industry in India, International Development Association, South Asia Department, Vol.1, May 22.

Ichiyo, Muto (1982) : 'Class struggle in Postwar Japan - Its Past, present and Future', Ampo Japan-Asia Quartery Review, Vol.14, No.3.

Ichiyo, Muto (1984) : 'Class Struggle on the Shopfloor -- The Japanese Case (1945-84)', Ampo Japan-Asia Quarterly Review, Vol.17.

IDCJ (1977) : Japan's Historical Development Experience and the Contemporary Developing Countries, Prepared for Economic Planning Agency by International Development Center of Japan, March.

ILO (1976) : Multinationals in Western Europe:The Industrial Relations Experience, Geneva.

Isaac, T M Thomas (1982) : 'Class Struggle and Structural Changes Coir Mat and Matting Industry in Kerala, 1950-80', EPW , Vol.XVII, No.31, July.

Isarangkun, Chirayu (1979) : 'Development of Small-Scale Industries and their linkages with large and basic industries (Thailand)', Small Industry Bulletin for Asia and the Pacific, No.16. UN, New York.

Ishihara, Takashi (1982) : 'Quality-Sustaining Competioness Among Industries and Firms', The Japan Economic Journal, June 28.

Jacobs, Michael (1985) : 'Philips takes hard line in India', IRENE (Industrial Restructuring Education Network Europe, Holland, No.3; Reproduced from Electronics Times January 17.

Jain, R.C. (1980) : 'Indian Standards for TV Industry', Electronics Today, Vol.13, No.2, February.

JETRO (1981) : Promotion of Small and Medium Enterprises in Japan, Japan External Trade Organisation, Tokyo.

Johnston, Bill (1983) : 'The House of the Future, Peppered with Electronics', The Times, June 14.

Johnston, Moira (1982) : 'High Tech, High Risk and High Life in Silicon Valley', National Geographic, October

Jones, Kent (1984) : 'The Political Economy of Voluntary Export Restraint Agreements', Kyklos, Vol.37.

Junko, Yamaka (1981) : 'Beyond Despair : One Autoworker's Season in Hell', (Review of Kamata's book in Japanese entitled Toyota : Factory of Despair in the Auto Industry - Diary of a Seasonal Worker published by Gendai Shuppen-Kai in 1973), Ampo Japan-Asia Quarterly Review, Vol.13, No.1

Kaimann, Richard A and Bechler, Barbara A (1983) : 'Robotics - What and Why now?' (Part 3) & 'Present and Future Applications' (Part 4), Industrial Management, Vol.25, No.2 & No.3, March-April & May-June.

Kale, B.K. (1979) : 'Development of Small-Scale Industries and their linkages with large and basic industries(India)', Small Industry Bulletin for Asia and the Pacific, No.16, UN, New York

Kalpagam, U (1981) : 'Labour in Small Industry Case of Export Garments Industry in Madras' EPW Vol.16, No.48, November 28.

Kalpagam, U (1985) : 'Women and the Industrial Reserve Army - A Reappraisal', Social Scientist 149-150, October-November.

Kam-Hon, Lee (1982): 'Development of Hong Kong's Place in International Trade', The World Economy, Vol.5, September

Kange, H.P. (1979) : 'Development of Small Scale Ancillaries A Conscious Management effort' (by Philips India), Laghu Udyog Samachar, April.

Kaplinsky, Raphael (1984) : 'The International Context for Industrialization in the Coming Decade', The Journal of Development Studies, Vol.21, No.1, October.

Keesing, Donald B (1982) : 'Linking up to Distant Markets: South to North Exports of Manufactured Consumer Goods', The American Economic Review, Vol.73, No.2, May.

Keiko, Nakajima (1983) : 'Women Organize to tackle the World of new technology', Ampo. Japan-Asia Quarterly Review Vol.15, No.2.

Kelly, John (1982) : 'Useful work and useless Toil', Marxism Today, August.

Keltron (no date); The World of Keltron, Public Relations Dept.

Keltron (1974-75 to 1982-83) : Annual Reports

Keltron (1981) : A Study of Consumer and Dealer Attitudes on Television in Bangalore City, CMD/MPC/005/(classified) November.

Keltron (1981 to 1983-84) : Management Information Reports on Sales (classified), Compiled by Market, Planning Group.

Keltron (1982) : Market Survey Report on Television Receiver at Bombay, Calcutta and Delhi, CMD/MPC/007 (classified)

Keltron (1983): Project Report for the Manufacture of Television Receivers at Manjeri in Malappuram District, Classified mimeo.

Keltron, (1983) : Project Report for the Manufacture of Television Receivers at Manjeri in Malappuram District, classified mimeo.

Keltron (1984) : Marketing Probe, GSD/MP/01/(classified)

Kobayashi, Kaoru (1984): 'Towards Better Understanding of Sogo-sosha', The Japan Economic Journal, January 31

Koenigsberger, F (1978) : 'Production Engineering', in Williams, Truor I (ed.), A History of Technology, Clarendon Press, Oxford.

Kothari, Smithu (1983) : 'There's Blood on Those Match Sticks : Child Labour in Sivakasi', EPW, July 2.

Kraar, Louis (1986) : 'Reheating Asia's "Little Dragons', Fortune International, May 26

Kulkarni, V.P. (1984) : Small Scale Industry Technology Utilisation for Development of Advanced Electronics, EXCEL-84, Ahmedabad.

Kulshreshta, D.K. and S.K. Sharma (1980): 'Child Labour in Moradabad Metalware Industry', Economic Times, October 19.

Kumar, Satish (1981) : Electronics Industry in Kerala - Present Status and Growth Perspectives, Seminar on 6th Plan of Kerala, Indian School of Social Sciences, January 30, Trivandrum.

Kurien, C.T. (1978) : 'Small Sector in New Industrial Policy', EPW Vol.13, No.9, March 4.

Lakshman, T.K. (1970) : Problems and Prospects of ancillary industries in a growing economy. A Study based on the Survey of ancillary - parent establishments in Mysore, Radha Publications, Bangalore, April.

Lall, Sanjaya (1973) : 'Transfer-Pricing by Multinational Firms', Oxford Bulletin of Economics and Statistics, Vol.135, No.3.

Lall, Sanjaya (1980) : 'Vertical Inter-firm linkages in LDCs : An Empirical Study', Oxford Bulletin of Economics and Statistics Vol.42, No.3, August.

Lamphere, Louis (1979): Fighting the Price-rate system: New Dimensions of an old struggle in the Apparel Industry, in Andrew Zimbalist (ed.), Case Studies on the Labor Process. Monthly Review Press.

Landsberg, Martin (1979) : 'Export-Led Industrialization in the Third World : Manufacturing Imperialism', The Review of Radical Political Economics, 11:4, Winter

Lenin, V.I. (1898) : 'The Handicraft Census of 1894-95 in Perm Gubernia and General Problems of "Handicraft" Industry', in Collected Works Volume 2, Progress Publishers, Moscow, 1972.

Lenin, V.I. (1899) : The Development of Capitalism in Russia, Progress Publishers, Moscow. 1972.

Levine, Solomon B (1965) :'Labor Markets and Collective Bargaining in Japan', in Lockwood, William W (ed.). The State and EconomicEnterprise in Japan Essay in the political economy of growth, Princeton University Press.

Levkovsky, A.I (1972) : Capitalism in India : Basic Trends in its Development, Peoples Publishing House.

Lim, Linda Y.C. and Fong, Pang Eng (1982) : 'Vertical Linkages and Multinational Enterprises in Developing Countries',World Development, Vol.10, No.7, July.

LINTAS (1984) : Television in India, Media Department,India, January.

Lipietyz, Alain (1982) : 'Towards Global Fordism?', New Left Review No.132. March-April.

Lipietz, Alain (1983) : 'Which Social Forces are for change?' TELOS, No.55, Spring.

Littlefield, Alice (1979) : 'The Expansion of Capitalist Relations of Production in Mexican Crafts', The Journal of Peasant Studies, Vol.6, No.4, July.

Littler, Craig R (1982) : The Development of the Labour Process in Capitalist Societies A Comparative Study of the Transformation ofWork Organisation in Britain, Japan and the USA, Hlinemann Educational Book Ltd., London.

Lobo, Alfred Gorden (1987) : 'Subcontracting Exchanges Ideal for India', Economic Times, February 12.

Lockett, Martin (1986) : 'Small Business and Socialism in Urban China', Development and Change, Vol.17, No.1.January

Locksley, Gareth (1986) : 'Information Technology and Capitalist Development', Capital & Class No.27,Winter

Lydall, H.F. (1958) : 'Aspects of Competition in Manufacturing Industry', Bulletin of the Oxford University, Institute of Statistics, Vol.20. No.4.

Maddock, Ieuan (1973) : 'Can Science - based companies survive ?', New Scientist, Vol.59, No.862,6th September

Maddock, Ieuen (1973) : 'Subcontracting - key to technological survival, New Scientist, Vol.59, No.863, 13 September

Maddock, Sir Ieuan (1980) : 'Micro-processors, Luddites and their consequences', The World Economy, Vol.3,No.3, November.

Madeuf, Bernadette (1979) : International Subcontracting in the World Economic System and Putting Out in the Emerging Capitalist Economy, paper presented at the Celloquium "Production and Reproduction of the Labor Force".S.Giovanni in Fiore, June 4-6.

Mahajan, V.S. (1980) : 'Small and Tiny Units: Impact of Government Assistance', Economic Times, October 2

Majumdar, Badiul Alam (1979) :'Innovations and International Trade: An Industry Study of Dynamic Competitive Advantage, Kyklos, Vol.32

Mandel, Ernest (1962) : Marxist Economic Theory, Marlin Press, London.

Mandel, Ernest (1975) : Late Capitalism, Verso 1975.

Marsh, Robert M & Hiroshi Mannari (1976) : Modernization and the Japanese Factory, Princeton University Press, USA.

Marshall, Jane (1984) : 'China Extends Open Door Trade policy', The Guardian, July 29.

Marx, Karl (1887) : Capital Volume I (Parts IV & VI), Progress Publishers, Moscow. 1983.

Massey, Dorcen (1978) : 'Capital & Locational Change: The UK Electrical Engineering and Electronics Industries', Review of Radical Political Econbmics, Vol.10, No.3, Fall.

Massey, Doreen and Meegan, Richard (1982) : The Anatomy of Job Loss, Metheven & Co.Ltd., London.

Mathew, P.M. (1985) : 'Exploitation of Women's Labour: An Analysis of Women's Employment in Kerala', Social Scientist 149-150, October-November.

McMcomes, Maggie (1986) : 'Cutting Costs without Killing Business', Fortune International, October 13.

McMillan, Charles J (1985) : The Japanese Industrial System, Watter de Gruyter Berlin/New York.

Mehta, Balraj (BM) (1982) : 'Form R and D to subcontracting', EPW April 1982.

Mehta, S.C. and G.S.Varadan (1984) : 'State - of- the Art of Microelectronics in India', Electronics, Information and Planning, Vol 11, No.8, May

Mendelievich, Elias (1980) : Children at Work, ILO Geneva.

Misra, Lokesh (1985) : Trading Houses in India: An Evaluation, Working Paper 25 ICRIER, February, New Delhi

Mishra, G.P. and P.N.Mishra (1979) : 'Government Policies for Promoting Small Scale Industries', Laghu Udyog Samachar, June.

MITI (1974) : Industry of Japan Book-2, Ministry of International Trade and Industry, Tokyo.

Mitter, Swasti (1986) : 'Industrial Restructuring and Manufacturing Homework: Immigrant Women in the UK Clothing industry', Capital & Class No.27, Winter

Morris-Suzuki, Tessa (1984) : 'Japan's role in the new international division of labour', Journal of Contemporary Asia, Vol.14, No.1.

Mundle, Sudipto (1981) : 'Some speculations on Growth, Disparity and Capital Re-organisation in the Indian Economy', EPW, Annual No.

Murray, Fergus (1983): 'The Decentralisation of Production- the decline of the mass-collective worker ?', Capital & Class, No.19, Spring.

Nabi, Ijaz (1985) : Subcontracting and Industrialization in Developing Countries, Discussion paper No.481, Economic Growth Center, Yale University, May

Nag, A. (1978) : 'Growth of the Small-Scale Sector : An Assessment', Yojana, 16 December.

Nag, A. (1980) : 'Small Industries : Aspects of Their Mortality', Economic Times, October 6.

Nagaraj, R.(no date): Subcontracting in Indian Manufacturing Industries -- Analysis, Evidence and Issues, Working Paper 192, CDS, Trivandrum.

Nagaraj, R (1980); On Crisis andAccumulation : An Attempt Towards Understanding the Development Tendencies of Capital in India since the Mid-60s. , CDS (mimeo)

2.

Naisbitt, John (1983) : 'Computer trends', Spectrum, Vol.20 No.11, November,

Nakajo, Seiichi (1980): 'Japanese Direct Investment in Asian Newly Industrializing Countries and Intra-firm Division of Labour', The Developing Economies, Vol.18,No.4

Nakamura, Hideichiro (1986) : 'The Challenge of Japanese Small Business', Japanese Economic Studies, Fall.

Nakamura, Koji (1982): 'How They Captured the World Market', Special Feature on Japan, The Hindu, July 19.

Nakase, Toshikazu (1981) : 'Some Characteristics of Japanese-type Multi-national Enterprises Today', Capital & Class, 13, Spring.

Nambiar, KPP (1984) : 'Vast Potential for Consumer and high technology Electronics', The Hindu, May 17

Nanda, H.P. (1980) :'Factors Affecting the Growth of Ancillaries', Lok Udyog, March.

Naqui, S.H. & B.A.Iqbal (1983) : 'Indian Electronics: An Integrated Policy for Planned Growth and Development', Purchase (Products, Equipments and Processes), Vol.8, No.11, November,

Narasimhan, R. (1984) : 'Information Technology in the 80s: Some Lessons for India', Computer Science & Informatics, Vol.13, No.2.

Navarro, Vincente (1982) : 'The Labor Process and Health: A Historical Materialist Interpretation', International Journal of Health Services, Vol.12, No.1

Naya, Seiji (1985) : 'The Role of Small-Scale Industries in Employment and exports of Asian Developing Countries', Hitotsubashi Journal of Economics, Vol.26, No.2,December.

Neri, Michael (1984): 'Electronics: Will India Miss the Bus Again?', Business World, February 13-26.

Nevins, James L and Whitrey, Daniel E (1978): 'Computer-Controlled assembly', Scientific American, Vol.238,No.2, February.

Nicbel, Benjamin W & Maurice S.,Gjesdahl (1971) : Industrial Engineering and Technology, APO, Tokyo

Norton, R.D. (1986): 'Industrial Policy and American Renewal', Journal of Economic Literature, Vol.24, March

Novek, Joel (1984) : 'The Mechanisation of Work: Paradise or Purgatory?', Challenge September - October

Odaka, Konosuke (1978) : The Place of Medium-Small Scale firms in the development of Automobile Industry -- A study of Japan's experience. Papers & Proceedings of the Conference on Japan's historical development experience and the contemporary developing countries : Issues for comparative Analysis. February 13-14. International Development, Center of Japan, Tokyo, October. ✓

Odaka, Konosuke (ed.) (1980): The Motor Vehicle Industry in Asia, a study of ancillary firm development, Manila,June (mimeo) ✓

Odaka, Konosuke (1982) : Is the division of labor limited by extent of Market ? A study of Automobile Production in East & South East Asia, Conference on Japan's historical development experience and the contemporary developing countries: Issues for comparative analysis - Phase II, January 6-8, International Development Center of Japan. ✓

OECD(1969) : Promotion of Small and Medium Sized Enterprises in Developing countries through Collective Actions, Paris.

OECD(1971) : Problems and Policies Relating to Small and Medium-sized Business, Paris

OECD (1972) : Policies to Assist Adaptation by Smaller business, Paris.

OECD (1982) : Innovation in Small and Medium Firms, Paris

Ofreneo, Rene E (1984) : 'Contradictions in Export-led Industrialisation : The Philippine Experience', Journal of Contemporary Asia, Vol.14, No.4.

Okochi, Kazuo, Karsh, Bernard and Levine, Solomon B (ed) (1974) : Workers and Employers in Japan The Japanese Employment Relations System, Princeton University Press/ University of Tokyo Press.

Onn, Fong Chan (1980): 'Appropriate Technology : An Empirical study of Bicycle manufacturing in Malaysia', The Developing Economies, Vol.18, No.1, March.

Oommen, M.A. (1972) : Small Industry in Indian Economic Growth A Case study of Kerala, Research Publications in Social Sciences, Delhi-6.

Pandhi, Bindoo (no date): The Ancillary Relationship -- A Case Study of a Public Sector Unit and its ancillaries, (mimeo)

Papola, T.S. & Mathur, R.S. (1979) : Inter-sectoral linkages in Manufacturing : A Study of Metal Engineering Industry in Kanpur, Giri Institute of Development Studies, Lucknow.

Parameswaran, D (1983) : Market Study on Television in Trivandrum On Behalf of Keltron, Dept. of Business Administration, Annamalai University, August.

Pascale, Richard Tanner and Athos, Anthony G (1982) : The Art of Japanese Management, Penguin Books.

Patel, J.T. (1984) : Role of SSI in the Development of Electronics and Its Problems, EXCEL-84, Ahmedabad.

Patel, Sujata (1983) : 'Contract Labour and Public Interest Litigation', EPW, December 17.

Patrick, Hugh and Rosovsky, Henty (ed.) (1976) : Asia's New Giant How the Japanese Economy works, The Brookings Institution, Washington, D.C.

Payer, Cheryl (1982) : The World Bank A Critical Analysis, Monthly Review Press.

Peattic, Lisa R (1982) : 'What is to be done with the "Informal Sector"? A Case Study of Shoe Manufacturers in Colombia', in Safa, Helen I(ed)., Towards A Political Economy of Urbanization in Third World Countries, Oxford University Press.

Penrose, Edith T (1968) : The Theory of the Growth of the Firm, Oxford University Press.

Pineda - Ofreneo, Rosalinda (1982) : 'Philippine Domestic Outwork: Subcontracting for Export-Oriented Industries', Journal of Contemporary Asia, Vol.12, No.3.

Poornam, R (1980): 'Ancillary Industry Development', Lok Udyog, March

Pratten, C.F. (1971) : Economics of Scale in Manufacturing Industry, Cambridge University Press.

Putman, John J (1983) : 'Special Economic Zones China's Opening Door', National Geographic Vol.164, No.1, July 1983

Rada, Juan (1980): The Impact of Micro-electronics A Tentative Appraisal of Information Technology, ILO, Geneva.

Radhakrishna, A. (1976) : 'Towards a Solid State Television Screen', Invention Intelligence, March.

Rajagopalan, V (1986) : The Handloom Industry in North & South Kerala A Study of Production and Marketing Structures M.Phil. Thesis , CDS.

Ramachandra, B (1980): 'HMT's Role in Fostering Ancillaries', Lok Udyog, March

Raman, C.S. (1984) : 'Development of Ancillaries', EPW May 19-26.

Rao, C.S.S. (1980) : 'Ancillary Development in ITI', Lok Udyog, March.

Rath, Ajay Kumar (1982) : 'Local and Global Operations of Multinational Corporations: Uniliver in India', Social Scientist Vol.10, No.10, October

Razzaque,A (1980) : 'Present and Future Technological Trends in TV ', Electronics Today, Vol.13, No.2, February

Revelli, Marco (1982) : 'Defeat at FIAT (Italy), Capital & Class 16, Spring.

Richman, Louis S (1986) : 'Volkswagen regains some beetle magic', Fortune International, March 31.

Robert, Annette (1983): 'The Effects of the International Division of Labor on Female Workers in the Textile and Clothing Industries', Development & Change, Vol.14,No.1, January.

Rosen, George (1986) : 'Industrial Technologies and Industrial Policies in India or when small is not Beautiful', in James Warner Bjorkman (ed)., The Changing Division of Labor in South Asia, The Riverdale Co.Publishers, USA.

Rothwell, Roy and Zegveld, W (1978): Small and Medium-sized Manufacturing firms: Their Role and Problems in Innovation Government Policy in Europe, the USA, Canada, Japan and Israel (2 volumes), Report prepared for six countries programme on Govt.Policies towards technological innovation and industry, TNO, Delft/Netherlands, June.

Sachitanand, N.N. (1982): 'West European industry-I & II', The Hindu, October 19

Sachitanand, N.N. 'Pyramidal Industrial Structure', The Hindu, March 11

Sachitanand, N.N. (1983) : 'Leap-frog in robotisation', The Hindu, March 24.

Sadamoto, Kuni (1981) : Robots in the Japanese Economy Facts about Robots and their Significance, Survay Japan, Tokyo.

Safa, Helen I (1981): 'Runaway shops and Female Employment: the search for cheap labor', Signs : Journal of Women in Culture and Society, vol.7,No.2, Winter

Sädeman, Hugh (1981) : 'A Survey of Japanese Industry where growth still works', The Economist 18-24 July.

Sandesare, J.C. (1978) : 'Small Industry Production in 1982-83, A quick estimate', EPW, Vol.13, No.17, April 29.

Sandesara, J.C. (1981): 'The Small Industry Question : Issues, Evidence and Suggestions', in Bagchi A.K. & Nirmala Banerjee (ed.), Change and Choice in Indian Industry, published for Centre for Studies in Social Sciences by K.P.Bagchi and Co. Calcutta/New Delhi.

Sandesara, J.C. (1982) : 'Incentives and Their Impact Some Studies on Small Industry', EPW, November 27.

Sapre, S.A. (1982) : Productivity in Japan : Lessons for India, Forum of Free Enterprise, Bombay 13, September.

Sarin, J.C. (no date): B & W TV : A Demand Forecast 1984-88, Consultant.

Sato, Ezuo (ed.) (1980): Industry and Business in Japan, Croom Helm, London.

Sawant, D.K. (1976) : 'Looking for Ancillary Development', Small Industry Bulletin for Asia and the Pacific, No.13

Schmiechen, James Andrew (1976): 'Sweated Industries and Sweated Labour : A Study of Industrial Disorganisation and Worker Attitudes in the London Clothing Trades, 1867-1909', The Journal of Economic History, Vol.36, No.1,March.

Schnitiz, Hubert (1982) : 'Growth Constraints on Small-Scale Manufacturing in Developing Countries: A Critical Review', World Development, Vol.10, No.6, June.

Schmitz, Hubert (1982) : Manufacturing in the Backyard Case Studies on Accumulation and Employment in Small-Scale Brazilian Industry, Frances Pinter (Publishers), London

Schmitz, Hubert (1984) : 'Industrialization strategies in less Developed countries: Some lessons of Historical Experience', The Journal of Development Studies, Vol.21, No.1, October.

Schouberger, Richard J (1983) : 'Plant layout becomes product-oriented with Cellular, just-in-time production concepts', Industrial Engineering, Vol.15, No.11, November

Scott, Joan Wallach (1982) : "The Mechanisation of Women's Work', Scientific American, Vol.247, No.3, September,

Sharpston, Michael (1975) : 'International Subcontracting', Oxford Economic Papers (New Series) Vol.27, No.1, March.

Shaw, Annapurna (1985) : 'The Informal Sector in a Third World Urban Economy : A Case Study of Calcutta, India', Bulletin of Concerned Asian Scholars, Vol.17, No.1.

Shirokov, G.K. (1976) : 'Industrialization and Changing Pattern of India's Social System', Indian Left Review, Vol.4, No.12, October.

SIDO & AIEI (1983) : National Workshop on Subcontracting in Electronics (Proceedings and Background papers), February 11-12, Bangalore.

SISI (1979) : 'Fountain Pen Nib Industry at Sattur', Laghu Udyog Samachar, November.

Sit, Victor Fung-Shuen (1981): 'Informal Manufacturing Enterprises in China', Small Industry Bulletin for Asia and the Pacific No.17, UN, New York.

Sit, Victor Fung-Shuen (1981) : 'The nature and intensity of Subcontracting in small-scale industry' (Hong Kong), Small Industry Bulletin for Asia and the Pacific, No.17 UN, New York.

Sivanandan, A. (1979): 'Imperialism and Disorganic development in the Silicon Age', Race & Class, 21,2.

Snow, Robert T (1979): 'Multinational Corporations in Asia The Labour-Intensive Factory', Bulletin of Concerned Asian Scholars, Vol.11, No.4, October - December.

Sochor, Zenovin A (1981) : 'Soviet Taylorism Revisited', Soviet Studies Vol.33, No.2, April

Solinas, Giovanni (1982) : 'Labor Market Segmentation and Workers' Careers : the Case of Italian Knitwear industry', Cambridge Journal of Economics, Vol.6

Song, Du-yul (1982) : 'Is the Japanese Model an alternative?' TELOS, No.52, Summer

Spaeth, Anthony (1982) :'Kowloon's Apliu Street is place to Find Fake Computers', The Asian Wall Street Journal (sometime in October)

Steek, P.M. (1980) : 'Micro-Computer Production Scheduling', Workstudy Vol.29, No.5, May.

Steven, Rob (1979): 'The Japanese Bourgeoisie', Bulletin of Concerned Asian Scholars, Vol.11, No.2, April-June.

Steven, Rob (1980) : 'The Japanese Working Class', Bulletin of Concerned Asian Scholars, Vol.12, No.3, July-September.

Storey, D.J. (1982) : Entrepreneurship and the New Firm, Croom Helm, London.

Streefkerk, Hein (1981): 'Too little to live on, Too much to die on Employment in Small Scale Industries in Rural South Gujarat', (Parts I,2, & 3), EPW, April 11,18 & 25.

Subramaniam, V.S.R. (1976) : 'Techno-Value Analysis for Television Cost-Reduction', Invention Intelligence, April.

Subrahmanian, K.K. (1976-77): 'Linkages of Small Scale Industry : Implications for Employment Generation; The Indian Journal of Labour Economics, Vol.19, October - January.

Subrahmanian, K.K. and P.M.Pillai (1978) : Multinationals and Indian Export, Sardar Patel Institute of Economic and Social Research, Ahmedabad.

Subramanian, K.K. and P.M.Pillai (1986) : Kerala's Industrial Backwardness An Exploration of Alternative Hypotheses, Working paper 210, CDS.

Sutton, C.J. (1980): Economics and Corporate strategy, Cambridge University Press.

Takco, Tsuchiya (1978): 'FTZs in Southeast Asia', Monthly Review 29:9 February

Tanaka, Takuo (1980): 'The Patterns of International Specialization among Asian Countries and the Future of Japanese Industry', The Developing Economics, Vol.18,No.4. December.

Tharakan, P.K.M. (1979) : The International division of labour and multinational companies,Saxon House in association with the European Centre for Study and Information on Multinational Corporations.

Thomas, T (1981) : Managing a Business in India, Allied Publishers Pvt.Ltd.

Tillet, Anthony (1978): 'Industry and Management An historical perspective', in Tillet, Anthony, Thomas Rempuer and Gordon Wills (ed.), Management Thinkers Pelican Library of Business and Management Penguin Books. Reprinted.

Todd, Halinah (1983) : 'Jostling for a stake in the big car parts bonanza', South No.37, November.

Tripathy, R.C. (1980) : 'Status and Scope of Small Scale Sector in Electronics', Electronics, Information & Planning, Vol.7. No12, August.

Tsokhas, Kosmas (1981) : 'Social Capital, Interdependence and Japanese Multi-nationals', Journal of Contemporary Asia, Vol.11, No.4

Tsuchiya, Naotoshi (1964) : Small Business in Japan, in Symposium on Small Business Development Vol.1,APO, Tokyo.

Turner, Louis (1973) : Multinational Companies and the Third World (Ch.7 Runaway industries: cheap labor usaged), Allen Lane,.

UNCTAD (1975) : International Subcontracting arrangements in electronics between developed market-economy countries TD/B/C.2/144/Supp.1 UN, New York.

UNCTAD (1978) : The Role of TNCs in the Marketing and Distribution of Exports and Imports of Developing countries, TD/B/C.2/197, March 16.

UNCTAD (1978) : Electronics in Developing Countries: Issues in Transfer and Development of Technology, TD/B/C.6/34 UN New York.

UNIDO (1969) : Small Scale Industry in Latin America, UN, New York.

UNIDO (1974) : Subcontracting for Modernizing Economics, UN, New York.

Unnikrishnan, L (1983) : A Market Survey on Dealer Terms forTV in Madras city, BITS, June-July.

Upasani, L.R. (1975) : 'Subcontracting to foster the growth of small Industries', Productivity, Vol.15, No.4,January-March.

Upasani, L.R. (1976) : 'Development of Entrepreneurship in India', Small Industry Bulletin for Asia and the Pacific, No.13.

Van der Veen, Jan H (1973) : A Study of Small Industries in Gujarat State, India, Occasional Paper No.65, Employment and Income Distribution Project, Department of Agricultural Economics, Cornell University, May.

Varadan, M.S.S. (1982) : 'Production Engineering: Tool for higher Productivity', The Hindu, September 3

Vardhan, Anand (1980): 'Handmade Safety match units face fragmentation', Economic Times 7-3-1980.

Vepa, Ram K (1971): 'Small Industry in the Seventies', Vikas Publications, New Delhi.

Vepa, Ram K (1973) : 'Consorteum of Small Units in Electronics', Small Industry Bulletin for Asia and the Far East, No.11.

Vepa, Ram K (1976) : 'Aid in Marketing to Small Scale Electronics Production', Small Industry Bulletin for Asia and the Pacific, No.13.

Vepa, Ram K (1979) : 'Small & Medium Industry in China', Laghu Udyog Samachar, Vol.III No.7 February

Vepa, Ram K (1979) : 'Television in the Small Scale Sector', Laghu Udyog Samachar, June.

Vepa, Ram K (1980): 'Small Industry - Development of Marketing Technology', Economic Times, October 22

Vernon, Raymond (1973) : Sovereignty at Bay The Multinational Spread of US Enterprises, Penguin

Waite, David (1973) : 'The Economic Significance of Small Firms', Journal of Industrial Economics, Vol.XXI, No.2, April.

Watanabe, Susumu (1971): 'Subcontracting, Industrialization and Employment Creation', International Labour Review Vol.104, No.1/2.

Watanabe, Susumu (1972) :' International Subcontracting, Employment and Skill Promotion', International Labour Review, Vol.105, No.5 May.

Watanabe, Susumu (1974) : 'Reflections on Current Policies for promoting Small Enterprises and Subcontracting', International Labour Review, Vol.110, November.

Watanabe, S (1978) : Technological Linkages between Formal and Informal Sectors of Manufacturing Industry, Working Paper 34, Technology and Employment Programme, WEP 2-22, ILO, Geneva.

Watanabe, Toshio (1980) : 'An Analysis of Economic Interdependence among the Asian NICs, the ASEAN nations and Japan', The DevelopingEconomics, Vol.18, No.4

Waterman, Peter (1980): Workers, Peasants, Artisans and Mothers: Towards an understanding of Relations amongst the labouring poor in peripheral Capitalist Societies, UNITAR Conference on "Alternative Development Strategies and the Future of Asia". March 11-17, New Delhi.

Weigner, Kathleen K (1984) : 'America's Biggest Small Business', Span March 1984, Reprinted from Forbes 1983.

Wilkinson, Frank (1983) : 'Productive Systems', Cambridge Journal of Economics, 7

Wilson, Charles (1958) : 'Technology and Industrial Organization', in Singer et al (ed.) A History of Technology Vol.5, Oxford University Press.

Woodward, Joan (1980): Industrial Organisation Theory and Practice, 2nd edition, Oxford University Press.

World Bank (1979) : Indonesia : Cottage and Small Industry in the National Economy. (2 volumes), Report No.2490,-IND November 9.

Yamazaki, Mitsuru (1980): Japan's Community-Based Industries: A Case Study of Small Industry (Translated from Japanese),Asian Productivity Organisation, Tokyo

Yamazawa, Ippei (1980): 'Increasing Imports and Structural Adjustment of the Japanese Textile Industry', The Developing Economics, Vol.18, No.4, December.

Yorimitsu, Masutoshi (1980) : 'A Note on the Working Conditions of Subcontracting Establishments in Iron and Steel Industry', Hitobsubashi Journal of Social Studies, Vol.12, No.1, November.

_______________ (1976) : 'How innovation shook up an industry?', Business Week, February 16.

_______________ (1976) : 'Texas Instruments', Business Week May 31.

_______________ (1976): 'The Korean Economy and Small Industry Progress', Prepared by the Medium Industry Bank, Seoul, Republic of Korea, Small Industry Bulletin for Asia and the Pacific, No.13, UN, New York.

_______________ (1976) : ' Interim Report of the Panel on Guidlines for Price, Distribution and Other Controls in the Electronics Industry', Electronics, Information and Planning, Vol.4, No.3, December.

_______________ (1977) : Document: A Worker's Enquiry into the motor industry. The Institute for Workers' Control Committee of enquiry into the Motory Industry (Britain), Capital & Class, No.2

_______________ (1977) : 'Free Trade Zones & Industrialization of Asia', Ampo, Japan - Asia Quarterly Review (Special Issue), Pacific- Asia Resources Center, Tokyo.

__________ (1978) : 'The Reluctant Exporter', Business Week, No.2529, April 10.

__________ (1978) : 'Seiko's Smash : The quartz watch overwhelms the industry', Business Week, No.2537, June 5.

__________ (1978): 'Report of the ESCAP Fact-Finding Mission on Industrialization in Non-Metropolitan Areas', Small Industry Bulletin for Asia and the Pacific, No.15 UN

__________ (1978) : 'The TV - Set competition that won't go away', Business Week, No.2533, May 8.

__________ (1978) : Annual Report on Ancillary Industries Development 1977, Ancillary Development Division Office of the Development Commissioner (Small Scale Industries), New Delhi, January.

__________ (1978) : 'Proceedings of the Two-Day Seminar on the Role ofElectronics Development Corporations, Discussion', Electronics Today, May.

__________ (1978) : 'Summary of the Report of the Panel on Cost and Price Structure: Evaluation of Television Receiver Industry', Electronics, Information and Planning, Vol.5, No.4, January.

__________ (1978): 'Report of the Sub-Group on Consumer Electronics in Report of the Planning Commission Working Group on Electronics Industry (for Plan 1978-83)', Electronics, Information and Planning, Vol.6, No.1

__________ (1979) : 'Japan Auto parts makers mount a US invasion', Business Week, No.2582, April 23.

__________ (1979) : 'Detroits' new face toward its suppliers', Business Week, No.2604, September 24.

________________(1979) : 'Electronics: Has India Missed the Bus?', Business India, October 1 - 14.

________________(1979) : 'What ails India's Free Trade Zones?' Business India August 6-19.

________________(1979): 'Development of Small-Scale Industries and Their Linkages with Large and Basic Industries' (Thailand), Small Industry Bulletin for Asia and the Pacific, No.16, UN, New York.

________________(1979) : 'Development of Small-Scale Industries and their Linkages with Large and Basic Industries A Case study on the Philippine Car Manufacturing Progress', Small Industry Bulletin for Asia and the Pacific, No.16,UN New York.

________________(1979): 'Child Slavery (A vast, illegal workforce) The ILO issues a grim report', Time September 10

________________(1979) : 'Fountain Pen nib industry at Sattur', Laghu Udyog Samachar November

________________(1979) : 'Small Industries Profile of Chotanagpur Division (Bihar)', Laghu Udyog Samachar Vol.3, No.7, February.

________________(1979) : ' Ancillary development and subcontracting in India, Laghu Udyog Samachar, November.

________________(1980) : 'Computer Controlled Production', Workstudy Vol.29, No.1. January

________________(1980): 'Europe: Japanese exports have car makers quaking', Business Week, April 7.

________________(1980) : 'US autos losing a big segment of the market-for ever ?', Business Week, No.2629, March 24

__________ (1980) : ' Report of the Working Group on Colour Television', *Electronics, Information and Planning*, Vol.7. No.12.

__________ (1980): 'Match Units Scratch up a war', *Financial Express*, March 7.

__________ (1980): 'Cottage Match Units', *Economic Times*, July 3

__________ (1980) : 'Free Trade Zones : A Capitalist Dream', *Race & Class*, Vol.XXII, No.2, Autumn.

__________ (1980): 'Report of the Review Committee on Electronics' (Parts 1 & 2), *Electronics, Information & Planning*, Vol.17, Nos. 6 & 7, March & April.

__________ (1980) : 'Components for TV', *Television* Vol.30, No.5, Issue 353, March.

__________ (1981) : 'Hong Kong : Will runaway rents force companies out ?' and 'Technologies for the '80s', *Business Week*, July 6

__________ (1981): 'The Speed up in Automation Changing 45 million Jobs', *BusinessWeek*, August, 3.

__________ (1981) : 'Profile of Electronics Industry in India', Electronics Today', January.

__________ (1982) : 'Taiwan : Slowdown and disturbing trends', *The Hindu* (In arrangement with financial Times) August 25.

__________ (1982) : 'Challenge of the Four 'new Japans', *The Hindu* September 5 (in arrangement with the New York Times).

________________(1982) : ' Japanese Workers and the Right-Wing Offensive'. An interview with Higuchi Tokuzo, the editor of Rodo Joho (Workers' Information), Ampo, Japan-Asia Quarterly Review Vol.14, No.3.

________________(1982) : 'Electronics : An Odious Comparison', The Hindu, December 4

________________(1982) : 'The Confusion about 100% Export Units', Business India, July 5-18.

________________(1982) : 'Colour TV : After Asiad what?', Business India, Sept. 27 - Oct.10.

________________(1983) : 'Philip's High-Tech Crusade', Business Week, July 18.

________________(1983) :'Computerization and Women in Japan', by Committee for the protection of women in the Computer world Ampo, Japan-Asia Quarterly, Review Vol.15, No.2.

________________(1983) : 'FixingElectronic Components on to Printed Circuit Boards', Financial Times, February 17, London.

________________(1983) : 'Applications Consumer Electronics: Component Television', IEEE Spectrum, Vol.20,No.6, June

________________(1983) : 'World's Smallest Colour TV is made', The Japan Economic Journal,June 7

________________(1983) : 'Wage Gap Between Young Workers and Higher Age Groups Increases', The Japan Economic Journal April 5.

________________(1983) : 'Flexible Automation in Manufacture', Excerpts from M.Engene Merchants' article in IEEE Spectrum (May 1983), The Hindu September 14.

__________(1983) : 'Report of the Seminar on Subcontracting and Complementation in the Electronics Industry in Developing Countries of ESCAP region' Electronics, Information and Planning, Vol.10, No.6,March

__________(1983) : 'Maruti Udyog Limited: Vendor Development', The Hindu, February 12

__________(1984) : 'Hungary 'reforms' in East Europe', Frontier, May 19.

__________(1984) : ' A New Industrial Age Dawns in Asia', Newsweek, March 12.

__________(1984) : 'Industrial Japan'84', Far Eastern Economic Review December 20.

__________(1984) : "Sony develops Digital TV Featuring Clearer Picture', The Japan Economic Journal, January 31.

__________(1984) : 'Industry:Television sets', UPDATE, April 25 - May 1

__________(1984) : 'Television: The Great Leap Forward', Business India, June 18-July 1, 1984.

__________(1984): 'Auto ancillaries: the challenge of change', Business India, April 23 to May 6

__________(1984) : 'A new boost to FTZs', Business World, February 13-26.

__________(1984) : 'Hosiery strike', Frontier, June 23.

__________(1984) : ' Clearer Liquid Crystal TV', The Hindu, March 21, ____________(1984); 'New Flat-Screen Pocket TV', The Hindu, April 1

____________(1984):'Floppy-disk drive Market is Expanding at Fast Pace', The Japan Economic Journal, February 14

____________(1984) : 'The Video Revolution', Newsweek August 6

____________(1984) : 'A Factory with 100 workers Makes 150,000 Cars a Month', The Japan Economic Journal, January 31.

____________(1984) : 'Makers Stepping up Investments in Korea, Taiwan and Southeast Asia', The Japan Economic Journal, March 27

____________(1984) : 'Prospects Bleak' for ITI Ancillaries' & 'Coping with Technological Change', The Hindu, February 25

____________(1984) : 'Report of the Study Team on consumer Electronics Industry', Electronics, Information and Planning, Vol.11, No.12, September,

____________(1984) : 'Spotlight : Electronics Gathering Momentum'. The Economic Scene, May

____________(1984) : 'Enterprise : A Smashing success' (garments), Business India, April 23 - May 6.

____________(1984) : 'Support Concession to export-oriented units', The Hindu, May 30.

____________(1984) : 'Hosiery units in knots', The Hindu July 8.

____________(1984) : 'Slim, Short, Small', (Special Feature on the changing atmosphere in Indo-Japanese Relations), The Hindu, May 3.

______________(1985) : 'Ambattur : Industrial Scene', The Hindu (Special Report), August 20.

______________(1985) : 'Semiconductor Industry' (Survey) Financial Times, December 6

______________(1986) : 'High Technology - A Survey of Japan and America ', The Economist, August 23.

______________(1986) : 'A Guide to Better Buying', The Economist, October 18-24.

______________(1986): 'Beyond factory robots ', The Economist July 5

______________(1986) : 'The Factory of the Future' & 'Trying it all together ' & 'Tools with minds of their own', The Economist (Science & Technology) 5-11 April.

______________(1986): 'Japan : Suffering from the Endaka ', Time October 13

______________(1986) : 'Homeworking, Time for Change' (An Exhibition by the Cockpit Gallery with the Londonwide Home Working Group), Feminist Review No.22, Feb.

______________(1986) : 'Towards a Modern, Viable Ship-building Industry', The Hindu, October 23

______________(1986) : 'Television Boom Petering Out', Business Standard, February

______________(1977) : 'America's Cheap-Labor Jone : Mexico Lures US Firms South of the Border', Newsweek, January 12.