MICRO-LEVEL INDUSTRIAL RESTRUCTURING AND EMPLOYMENT RELATIONS IN TIMES OF NEW COMPETITION: A BRIEF SURVEY AND RESEARCH AGENDA

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Informed by the debates concerning best practice models of manufacturing, and by employing mainly a qualitative analysis of firm-level responses to the new competitive pressures not only in terms of cost but also a range of non-cost factors such as quality, product variety, speed of delivery and product features, this study seeks to document and discuss (a) the processes of change, adaptation and barriers to change in the adoption of new technologies as also Japanese manufacturing techniques and (b)the consequent implications for labour in terms of employment relations policies and practices in a selected sample of large, medium and smaller firms in the auto component supply chain in India. In so far as the component firms are not only linked to assemblers but also with their own suppliers in the vertical supply chain through subcontracting relations, which are being restructured in terms of the "fewer and closer" model, the study, thus, hopes to contribute to the relatively unexplored link between industrial organisation within and between firms on the one hand and labour and human resource policies within the chain of component firms on the other.

I. INTRODUCTION

Employer strategies and employee responses in the micro management of the economy in the post-liberalisation context in India is a subject matter of topical interest. A major objective of economic reforms in India since 1991 is to make Indian industry domestically and internationally competitive, i.e. to enable it to produce goods and services of international quality at competitive costs. Even as the domestic firms face the daunting task of penetrating highly competitive export markets, intensified domestic competition is promoted through freedom of entry, foreign companies making investments in India and cheaper imports. In this changing milieu, this study is motivated by the curiosity to understand patterns of industrial restructuring and their impact on labour.

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Restructuring refers to "changes in the way goods and services are being developed, designed, produced and distributed, i.e. to changes in companies' organisational structures and the technologies they use."(Ruigrok and Tulder,1995). As Ghosh(1995) points out, three distinct patterns in industrial restructuring could be discerned in the Indian context.

The first and dominant pattern, which dates back to the 1980s, and perhaps even 1970s, is one of effecting widespread job losses and getting more work out of the remaining through stiffer productivity norms in organisations with poor labour relations or high manning levels. This restructuring involves downsizing, greater automation, increasing casualization and farming out as much activity as possible to contract labour, ancillaries or vendors, and thereby (a) reducing dependence on internal permanent workforce which is perceived by management to be expensive and difficult to manage and/ or (b) improving competitive advantage by cutting labour costs. Ramaswamy(1988) has extensively captured this restructuring.

In the second pattern, in terms of its approach to permanent labour, the stress is on redeployment rather than on attempts to get rid of a certain number of redundant workers due to rationalisation of production or introduction of new technology. It is accompanied by explicit policy statements by management that no employee would be retrenched or laid off, the surplus being absorbed in new work being generated. This restructuring, with attendant employment security, is made possible due to conducive labour relations climate.

The third pattern of industrial restructuring, about which mention is made in Indian industrial circles and business journals, concerns innovative shopfloor experiments(e.g. decentralised workstations, Japanese production methods),of pitchforking labour as the provider of competitive advantage to organsiational functioning. Barring a few pioneering studies by Ramaswamy and Schiphorst(1998) and Humphrey et al.(1998a, 1998b, 1998c), there is little systematic empirical research on the use of innovative work practices or Japanese manufacturing techniques or new technologies and their implications for labour in the Indian automotive industry. It is in this milieu that this study intends to contribute to this empirical ground work.

II. BACKGROUND:CONCEPTS, ISSUES AND PROPOSITIONS GUIDING THE RESEARCH

II.1 Competitive Strategies, Manufacturing Strategies and Employment Relations

Given the micro-level, enterprise focus of this study, it may be useful to search for an analytical framework by examining the choices that firms exercise with regard to their market positioning, manufacturing and labour policies; the factors underlying these choices, and the links between the choices made.

Competitive strategy(or business/market strategy) is the manner in which a firm positions itself competitively in a given market. In this regard, the most popular typology, used by both business policy and industrial relations researchers, is the one developed by Michael Porter(1980,1985 as cited in Arthur, 1992). According to him, there are two successful "generic" strategies that firms may use to achieve competitive advantage over other firms in a given industry. They may compete either by becoming the lowest cost producer of a

given product or service(the Cost Leadership Strategy) or by "differentiating" themselves from other firms on some basis other than low cost that is valued by customers, such as customised service or product quality, in the hope that customers will then pay a premium price for this "uniqueness"(the Differentiation Strategy). Further, for each type of strategy, firms can choose to compete in a broadly defined market or to focus on a specific segment of the market.

In terms of manufacturing/production processes used to implement these strategies, an analogy can be made between the Cost Leadership strategy and the mass production model (Piore and Sable:1984, in Arthur 1992), i.e. the use of dedicated production technology and processes to manufacture a single or relatively few commodity-type products in long runs in order to lower costs through economies of scale in the context of stable and predictable markets.

In contrast, the production process associated with a Differentiation Strategy may approximate Piore and Sable's description of flexible specialisation or small-scale flexible manufacturing, with the use of more flexible technology(CNC as the modern artisanal tool) to produce a broader range of more specialized, sophisticated quality products in smaller batches, for rapidly changing markets that are not price-sensitive, in sectors like ceramics, knitwear, handmade cars, machinery, fashion apparel and shoe manufacturing. According to Piore and Sabel (1984:17, cited in Ruigrok and Tulder, 1995):

"Flexible specialization is a strategy of permanent innovation: accommodation to ceaseless change, rather than an effort to control it. This strategy is based on flexible, multi-use equipment; skilled workers; and the creation through politics, of an industrial community that restricts the form of competition to those favouring innovation. For these reasons, the spread of flexible specialization amounts to a revival of craft forms of production."

Porter's typology, however, misses on a new paradigm of industrial competitiveness whereby, in fragmented, competitigve, unpredictable and uncertain markets, enterprises involved in repetitive manufacturing seek to win customers by competing not only price, but also on "critical selling factors" such as better design,product variety, quality and reliability, speed of delivery, etc.. We may, for the time being, call this the competitive strategy of Sophisticated Cost Cutting. The manufacturing strategy in relation to this is what the Japanese had developed originally, viz., flexible mass production or large-scale flexible manufacturing or what is currently known as "lean production", resulting in economies of both scale and scope.

Drawing on the Schumpetarian demonstration that innovation rather than adaptation which lies at the heart of the capitalist development process, Lazonick(1991) points out how, when faced with intensified new (international) competition, a dominant business organisation can choose from two broad, and very distinct, competitive strategies—one(market-shaping) innovative, and the other(market-defending) adaptive: "The innovative strategy is to plan, invest in, and create more powerful organisational and technological capabilities, perhaps coordinating the organisation's strategy with priveleged access to resources provided by the state. Alternatively, the adaptive strategy is to compete on the basis of productive capabilities from the past." As

Sengenberger(1992) elaborates, the short-term, defensive adaptive strategy aims to cut costs, especially labour costs using existing techniques whereas the latter seeks to reduce costs or improve quality or both by increasing efficiency. We can absorb Porter's cost based strategy into the adaptive strategy; and differentiation strategy as also what we have termed the sophisticated cost cutting strategy into the innovative strategy.

The adaptive strategy can imply not only straight forward cost cutting(wage and non-wage labour costs) but also rationalization of production in various ways. These two options correspond to the numerator and the denominator of unit labour costs defined as labour costs divided by output. Any thing that lowers the numerator, defined as production cost per working hour, brings down labour costs as well. And any improvement in the denominator, defined as output per working hour, will also lead to a reduction in unit labour costs. The various measures to do this could be, for example, (1)concession bargaining, i.e. the temporary or permanent reduction of wages, fringe benefits or other items of worker remuneration, on the understanding that this could save a firm or plant in difficulties;(2) extending operational hours or arranging for flexible working hours more in line with production needs;(3) increasing work loads(i.e. making workers work harder, unaccompanied by effort-saving technologies);(4)changes to labour legislation in terms of legal exemption from labour protection regulation;(5)relocating production to areas of lower labour costs or finding cheaper outsourcing of more expensive in-house production;(6)using and increasing different kinds of non-standard/atypical/ precarious forms of employment. Since any of these measures downgrade labour standards, the adoptive strategy is the "low-road" competitive strategy. Sengenberger(1992) comments thus:"poor wages and worsening terms of employment hinder the firm from acquiring and keeping the staff required for efficiency and flexibility; they rarely induce the firm to 'invest' in its labour force to make it more productive. So, in the absence of better performance and alternative possibilities, further cost-cutting may become inevitable, resulting in a vicious downward spiral." Although it is likely to be profitable only in the short-run due to limits to how far one can squeeze, it may be sufficiently profitable enough to appeal to managers and stockholders " who want to use the business as a cash cow, driving out the possibility of long-run improvement."(Helper,1990).

By contrast, the innovative strategy is one of constructive competition, and atleast in theory, can be the "high road" competitive strategy in that the economic gains due to efficiency enhancement and innovation can make possible workforce requalification, 'worker empowerment', broadening of job content, etc. along with improvement of wages and other rewards, safequaring of workers' rights, providing adequate standards of protection, etc.

Thus the perception of labour as a factor of industrial development and restructuring varies sharply between the two strategies. Obviously, labour is a static cost to be minimised in the "low road" whereas it is a dynamic resource for gaining competitive advantage on the "high road". The terms 'low road' and 'high road' to industrial restructuring are attributed to Sengenberger and Pyke(1992).

In the light of the above discussion, it is interesting to note the relationship between

competitive and manufacturing strategies on the one hand and "industrial relations system" or employment relations on the other. Borrowing from organisational strategy literature, Arthur(1992) defines an 'industrial relations system' as a "pattern in a stream of decisions regarding the policies and practices that govern the employment relationship. Employment policies and practices can be grouped into functional categories such as compensation, staffing, training, work organisation and employee relations. These policies and practices represent choices about how to handle "generic" aspects of the employment relationship, including organising work and designing jobs, attracting and maintaining qualified employees, and managing conflict in the workplace."

In the cost-based competitive strategy involving Fordist mass production, it is possible for firms following it, to breakdown the workprocess into relatively narrow, well-specified job tasks a la Taylorism, in order to reap three benefits of this,what Littler(1978) calls, the "minimum interaction employment relationship". First, the skill level requirements of employees needed to perform these tasks are reduced, which reduces wage levels needed to attract and retain qualified employees. Second, training costs for production employees are also reduced. Third, the combination of low skill requirements and low training investment reduces the costs of turnover for these firms. Production employees become more easily replaceable, interchangeable. Based on this logic, "Cost Reduction Industrial Relations System" is predicted to be associated with the cost-based strategy because a primary objective of this type of system is to reduce direct labour costs and other employment-related expenditures such as outlays for training and employee involvement programmes (see Table 1).

By contrast, "Commitment Maximising Industrial Relations System" or employment relations is predicted to be associated with the Differentiation Strategy(Table 1). The logic is that for firms to succeed through this market strategy, they must be flexible enough to quickly shift production and organisational resources to meet rapidly changing markets and customer demands. So, it is hypothesised that employees must have the skill and training to perform a variety of different tasks. Because it is more difficult to predetermine all production contingencies and situations, standardization is reduced and the level of uncertainity in performing production tasks increases. Production employees engaged in uncertain tasks are required to use some discretion in determining when and how to perform specific activities, consistent with the goals of the firm. To put it differently, the proposition of this choice is that offering skilled employees high levels of involvement, autonomy, general training and wages and benefits as well as a formal due process procedure, can be seen as a way to attract, motivate, and retain qualified employees who will internalize(be committed) the goals of the firm.

Now, it is not known if the successful flexible specialization or industrial districts experience of Emilia-Romagna region in Italy demonstrates, not only high road in terms of competing without wage cutting(the basic definition of high road) but also all the other features of high-road "industrial relations system" that Arthur(1992) is linking with the Differentiation Strategy. Perhaps such a linkage is valid only in relation to, say, a number of high-technology large firms

Table 1:Competitive strategy and employment relations

Industrial relations/ employment relations functions	Type	
	Cost reduction (Cost-based strategy)	Commitment max. (Differentiation)
Work Orgn	Narrowly defined job tasks	Broadly defined jobs
Training	Limited	More extensive,general skills training
Staffing/supervision	Low skill requirements High Intense supervision/control	% of skilled workers Self-managing teams
Compensation	Relatively low wages Incentive based Ltd. benefits	Relatively high wages All salaried/stock ownership More extensive benefits
Employee Relations	Very little employee influence over 'mgt.decisions'	High level of participation /involvement
	No formal employee complaint/grievance mechanisms	Formal dispute resolution procedures
	Little communication/ socialization	Regular information sharing with employees

long known for their commitment to state-of-the-art human resource policies, such as IBM and Digital Equipment Corporation.

Just like the predicted link between Differentiation Strategy and the Commitment Maximising Industrial Relations System, some leading protagonists of the "sophisticated cost cutting" strategy based on lean production logic have put forward its association with the following "high road" employment relations features in terms of high-performance work practices and personnel policies(MacDuffie and Kraficik, as cited in Cappelli and Rogovsky,1994; IILS,1993, pp.14-15):

- Employee empowerment and participation in decision-making: Production employees take over some tasks previously performed by supervisors, engineers and staff specialists
- Team work: Quality circles(focussing on quality andproductivity issues), Quality of Worklife programmes covering more issues than Quality Circles, and autonomous or semi-autonomous teams(taking over some direct supervision) all organise participation through groups. Teams actually substitute for formal management structure.
- Job rotation/cross-training: Employees swap tasks within teams and learn each other's jobs, and their skills become more interchangeable. Employees learn a wider range of skills to enable this to happen.
- Supportive Personnel practices: Rela-

tively high wages; profit sharing; pay for skill programme; employment security; training in basic communications and interpersonal skills and specific production knowledge and 'socialization'programmes which teach the values and implicit rules of the organisation, to develop high commitment

- Laboour-management relations based on consultation, consensus and cooperation

To sum up, while cost based strategies are expected to lead to a downward spiral of wages, working conditions and labour standards and to reinforce adversarial relations at the workplace, theory suggests that innovative strategies—not only the Differentiation(high-value-added) Competitive Strategy but also the Sophisticated Cost Cutting Strategy are expected to lead to the most fundamental transformations in employment relations and have the best chance of producing outcomes of mutual benefit to firms and their employees.

However, the interrelationship between competitive/manufacturing strategies and employment relations is not simple. It is complex and dynamic. While a competitive strategy appears to determine employment relations choices, the opposite may also hold good. That is to say that, for example, in unionised plants, employees may have the power to block an attempt by management to institute a Cost-Reduction type system. In this situation there may be a reconsideration of the competitive strategy. The very choice of competitive strategy and manufacturing strategy in response to new economic environment could depend a great deal on the nature of prevailing system of industrial relations. The cost reduction competitive strategy has been observed not only in the bilateral type of industrial relations(collective bargaining) via concession bargaining but also in the unilateral(no collective bargaining) contexts of deregulation of labour markets and individual bargaining. Similarly, the innovative strategy has been observed not only in the context of union-employer cooperation(at enterprise or supra-enterprise level) but also in the union-free Human Resource Management context(Sengenberger 1992).

More importantly, as Locke(1995) points out, while firms are indeed uneasily struggling with the choices of cost-based and innovative strategies, "few firms can be clearly indentified as pure adopters of either option. Instead we observe most firms engaging in both strategies, sometimes simultaneously, but often sequentially....a reverse trend can be observed as well." He gives a few examples as follows: "The dramatic changes in Fiat's strategy over the course of the 1980s and early 1990s illustrate the point most vividly. After an intensive period of labour conflict initiated by the company's decision to restructure and lay-off 20,000 workers in the early 1980s in order to reduce costs and weaken the unions, Fiat has engaged in a gradual process of rebuilding its relationships with its workforce and unions in order to pursue its current strategy of rapid product development, extensive use of state-of-the-art technologies and production of high-quality products.....IBM and Digital Equipment Corporation, have taken the reverse path in the 1990s as markets for their hardware products declined forcing them to downsize and cut labour costs dramatically."

Furthermore, it is quite surprising that those who predict an "industrial relations system" in tune with a particular business strategy,

ignore the differentiated employment environment within a firm. As Locke (1995) emphasizes, employers can have atleast two classes of employment—a small and shrinking core of more skilled and valued employees to which 'high road' employment practices are applied, surrounded by a large sweated periphery of lower-paid, less secure and less well-trained employees. The labour control and labour relations mechanisms would obviously differ between the two classes of employment.

This is not all. There is a fundamental problem in predicting links between competitive/manufacturing strategy and employment relations. As Cappelli and Singh(1992) argue, the kind of links pointed out by some of the protagonists of lean production (as shown earlier) between lean production and a set of unique human resource policies is based on the "concept of fit"—which is questionable. They write:"Such hypotheses are based are based on the following unspoken assertions:(1) A particular business strategy demands a unique set of responses from employees(behaviours and attitudes) in order to succeed. (2) A particular set of human resource policies produces a unique set of responses from employees. An argument about fit is really an hypothesis about the relationship between propositions (1) and (2). And that hypothesis cannot be true unless both propositions are also true.....We do not have a well developed and empirically verified body of propositions associated with categories(1) and (2). Until we can know more about what business strategies demand of human resources and what responses are associated with given human resource practices, it may be difficult to find relationship between them."

Finally, it may be noted that both cost-based and innovative strategies, in discrete products industries, usually involve subcontracting. In the cost-based strategy, outside suppliers can often be found who will do the same work faster for far less cost, due to , say the avoidance of union wages and restrictive work rules. The innovative strategy may involve subcontracting, for example, on the grounds of focussing on just a few activities or using technologies that are not available in-house or economising on scarce top management time(Helper,1990). Now, the crucial question of interest to us, for this study, is: in the innovative strategy, do the subcontractors too take to the high road path? Experience with regard to the implementation of the innovative strategy of lean production—the Western concept of perceiving and interpreting Japan's success through industrial organisation—shows the possibilities of low road as also high road-low road mix in both the assemblers and the subcontractors. So much so, Berggren(1993) opens his seminal critique of lean production thus: " In the auto industry, Japanese manufacturing systems have been debated for atleast 10 years. In this long-standing debate, one aspect is more intriguing, and that is the extremely contradictory assessments of the effects of Japanese prouduction management." Empirical generalizations are indeed diffcult to obtain apart from the fact that most of the empirics concern the highly context-specific case study experiences of mostly large assemblers and large component firms.

II.2 Best Practice Models of Manufacture

Several best practice models of manufacture as abstractions of the experiences in industrially advanced countries, have emerged as "important sources of inspiration for company strategies and

industry policies in developing countries."(Humphrey:1995). These prescriptive blueprints are the American based Systemofacture, the Japanese based lean production, and the Italian based industrial districts model based on flexible specialisation thesis.

II.2.1 Systemofacture

This is a neo-Schumpetarian, techno-centric paradigm of industrial production that glorifies the evolution of best-practice production into a pattern involving the adoption of systemic, information technology based or microelectronics based automation technologies, and the adoption of Japanese-style just-in-time production techniques (Kaplinsky,1985).

There are three distinct spheres of activity in manufacturing:design, production and coordination with each sphere comprising a set of discrete activities. Design sphere includes drafting, copying, basic and final design, and process engineering. Production sphere could be mixing, molding, cutting, handling, testing and packaging. Coordination sphere involves all managerial tasks needed to support and guide the firm's operations internally and in the market place.

According to this model, automation makes a multi-stage advance from the first level of intra-activity automation(involving automation of individual activities in a stand-alone fashion) to the second level of intra-sphere automation(involving integration of individual activities within the same sphere) to the third level of inter-sphere automation (involving integration and coordination of activities in separate spheres via their common dependence on digital control systems. A family of flexible automation technologies are involved in this process: Computer-aided design(CAD) in the design sphere; Computer-numerical control(CNC), robots, programmable logic controllers, automated materials handling systems and process controllers for real time control of production; and centralised data processing and office technologies in the managerial coordination sphere.

The central point of Kaplinsky is that although significant productivity and product enhancing gains are realized by the adoption of single, or a limited number, of such technologies, the major competitive gains arise out of the systemic interconnection throughout the enterprise. This development when coupled with the transition to a new structure of inter-plant relationships based on JIT production and delivery, will supplant the existing pattern of globally widespread, vertically integrated enterprises by geographically proximate plants, with closely coordinated product development, production and delivery schedules. "Thus, in terms of broad historical generalization, whereas the first industrial revolution involved the substitution of machines for labour(from 'manufacture' to 'machinofacture' in Marx's terminology), the current period may well be witnessing the transition from 'machinofacture' to 'systemofacture'. The basic argument, on this basis, of Kaplinsky is that unless intra-sphere or inter-sphere automation is pursued, it is unlikely that the Third World will be able to arrest the likely trend towards comparative advantage reversal. System of acture represents "a fundamental shift in the determinants of international location that work directly against the low-wage comparative advantage that the Third World currently relies on to secure presence in the international motor vehicle and components market."(Hoffman and Kaplinsky, in

Posthuma,1991). To which Posthuma(1991) critically reacts, inter alia, thus: "...the competitive pressures established by leading global automotive TNCs will determine the future shape of manufacturing activities(in the auto sector) in developing countries. While the power of these auto TNCs is undeniable,.....Kaplinsky's analysis underestimates the competitive strength which can be gained from firm level responses by developing country firms in transforming their manufacturing practices, or implementing focussed competitive and marketing strategies...a firm level study is necessary to examine the process of change within developing country factories to see if they conform to the expectations on which the conclusions" of this best practice model is based.

There are a number of points that need to be kept in mind while empirically examining the use of flexible automation by a firm as a response to increased international and domestic competition combined with a change in the nature of market demand for greater quality, more variety, custom product specification, improved delivery times and a shorter product life cycle. We draw from Hoffman(1989) in this connection.

First,the flexibility of flexible automation has a number of dimensions: product flexibility for easier changeover from product to product; volume flexibility for efficiently accommodating changes in volume; routing flexibility to process parts via different routes within the plant in response to breakdowns or other factors; machine flexibility to make different parts within a product family; operation flexibility to vary the sequence of operations; and process flexibility to produce a product family in different ways using different materials. Increased flexibility on all these fronts yields performance benefits in reducing lead time, increasing capacity utilisation and throughput rates, expanding product variety and lowering labour requirements.

Secondly, increased flexibility and integration in terms of flexible manufacturing system(FMS)——made up of 2 or more flexible manufacturing cells (FMC) (comprising 2 or more machines, i.e. machining centres and/or individual CNC tools) plus material handler, all controlled by computer), some form of automatic transportation system to move pallets, workpieces, and tools between machines, and all controlled by computer——mean that the scale-related constraints that have operated in batch and mass production are easing substantially. Minimum scale economies for mass production at the plant and product level are dropping, and batch producers are able to achieve scale economies at much lower output levels. However, FMS are said to be difficult systems to operate, requiring sophisticated supporting services and highly trained workers—factors that retard their diffusion, making their use unviable for large numbers of small and intermediate firms. It may be noted here, in passing, that engineering production falls into 3 categories:mass production of standardized parts, with tens of thousands of units manufactured per year; batch production involving annual volume from tens to thousands of units; and production of small lots, one-off items, and prototypes. Seventy per cent of components in the engineering industry are produced in batches of less than 50, by small firms—a difficult task in coping with the demands of their markets. Volumes are too low to used dedicated machinery and too large for single machines so much so that these producers

have in the past typically traded volume production for flexibility. But with the rise of flexible automation this problem is increasingly solved.

Thirdly, detailed research on the factors governing the failure of massive investments in rather excessive automation in the 1980s in the US, undertaken as a key to restoring competitiveness against the Japanese, raises important points on the basis of which primacy is placed on organisational reform for competitiveness. The current Japanese superiority in flexible automation is not because of greater investment but due to more efficient technology use based on prior rationalisation of production procedures and organisational changes. Thus, automation without simplification of all production procedures and tasks whereby everything that does not contribute to value would only accentuate technical and "absorption problems" and thereby inefficiencies.

Simplification can even reduce the need for automation. Moreover, and more importantly, successful implementation of flexible manufacturing technology involves achieving compatibility between technology and organisation into which it is being introduced. This compatibility requires organisational reform by way of functional integration and managerial restructuring. Functional integration implies minimising of inter-departmental and skill-based boundaries to reflect the integrated nature of technology. The Japanese concept of "design for manufacture"(which means that products are designed explicitly to simplify the manufacturing process) reflects the functional integration of design and production staff to develop suitable products. Similarly, in operating the new technology, new groupings of multi-skilled operators and engineers with close liaison with scheduling and marketing staff are required. Managerial restructuring means less heirarchical decision making, closer to production with a greater degree of delegated autonomy in order to rapidly respond to changing market conditions. This also implies that engineering, supervisory and other technical staff move into supporting role vis-a-vis production groups.

We may conclude this section as follows. First, systemofacture is still a theory, very far ahead of the current possibilities for cost-effective technological integration and diffusion. Secondly, There has been a new current of flexible automation technology and Japanese organisational innovations coalescing into a new best practice manufacturing system. This is reflected in the new theories of "modern manufacturing"(Milgrom and Roberts, 1990), and of "integrated manufacturing"(Snell and Dean, 1992) which capture this best practice fusion in manufacturing as the optimisation of the complementarities between flexible automation and Japanese style production and work organisation. However, the protagonists of lean production deemphasize the role of automation as a source of competitive advantage, suggesting thereby that doing away with waste(non-value adding activities) through intelligent intra-and inter-firm organisation is more important than automation. In fact, on this basis, the case is made for the the use of Japanese methods of production in the LDC context, as they are cost-effective vis-a-vis automation. Thirdly, while rationalisation of procedures and organisational change as a precursor or complement to automation is increasingly confirmed in the literature not only in the advanced industrial countries but also in certain LDCs, as Posthuma(1991) argues, the importance of technological

capabilities cannot be underplayed too much in the LDC context as well. While a piecemeal and selective use of automation(equipment and information systems) among assemblers and more so among component firms is essential to achieve precision, quality, flexibility and cost cut-backs, cultivating in-house technological capabilities is acquiring greater importance for auto components firms in the 1990s for four reasons:(a) rapid transformation in the performance characteristics of the automobile;(b)the range of new materials as well as electronics that has begun to be incorporated poses new technological challenges requiring new material know-how and production equipment;(c) the increasing trend of auto assemblers passing on the responsibility for the development and design of new products to their preferred suppliers; and (4) fundamental changes in the design characteristics of components due to the trend of 'design for manufacture' resulting in modular assembly—what is technically known as 'corner engineering' or 'simultaneous engineering'.

II.2.2 Lean Manufacture

As already mentioned, lean production is the popular synonym for the best practice Japanese model of production which in turn is the idealisation of the Toyota production system, and hence it is also called Toyotism vis-a-vis Fordism. But what is the operational definition of lean production? What is unique about it? And how can we empirically go about categorising an enterprise as lean? There is no single, easy and clear answer at all. For example, IILS (1993) brings together diverse views and presents the reader with a rich picture of utter confusion, perplexity and complexity in terms of many many questions to ponder over at the end of everyday.

For example, at the point of production, the term 'lean' conveys the notion of a "minimum factory" that uses up less of all inputs to create outputs similar to the traditional mass production system but offering an increased choice for the end consumer. However, Williams and Haslam(1992) have made the case that by the measure of leannes in inventory and turnover in stock, the supposed lean producers cannot be separated from the mass producers. According to them, Toyota, the leading lean producer is no better in terms of low stocks and rapid stock turnover, than Henry Ford's Highland Park factory that introduced mass production to the world. Similarly, to categorise leanness of an enterprise on the basis of flexible human resource practices in terms of team working is problematic. For example, Lewchuk and Robertson(1997) inform us as follows:"Because many North American plants have not adopted the human resource practices of Japanese (transplant) manufacturers, and because teams seem to have less important role in North America, it has been suggested that North American plants are not really lean....Canadian plants are described as Fordist...(despite) the fact that the average Canadian plant has lower buffer stocks, higher productivity, and fewer quality defects than comparable American plants." As they point out, it is rather process control and discipline, and not the use of teams or any other Japanese style human resource practice intended to modify the attitude of workers towards their employers, that leads to high productivity.

It is customary on the part of many writers to distinguish lean production from mass production by aligning the oppositions between the two(as shown, for example,in

Table 2:Mass vs.Lean production

Mass	*Lean*
Standardized products	Diversified
Economies of scale	Economies of scope
Detailed division of labour	Team work and skills
Centralized management	Decentralized control
Low cost, expost quality	Ex-ante quality at least cost
Vertical integration	Development of supply chains
Divisionalized design engineering	Simultaneous engineering
Long product life cycles	Parallel product life cycles
Antagonist industrial relations	Compliant industrial relations

Source:Cooke, in IILS(1993)

Table 2), but according to Cooke(in IILS,1993), "it is misleading. First, the pure model of lean production is as impossible to find in reality as the pure model of Fordist mass production. In each case these are idealizations and, as such, helpful but by no means definitive. Second, mass and lean production are not, in fact, opposites but earlier and mature versions of large-scale production of volume output for a more quality, value-for-money conscious, rather more diversified and segmented but, ultimately, still in scale terms, mass market. So, while LP embodies some elements of the craft tradition, notably in the idea of "manufacturability" or designing products with manufacturing in mind ex ante rather than ex post, the aspiration towards a more rounded skill profile for workers, and the heightened concern with quality, it does so with a view to gaining unit cost ratios far lower than those associated with Fordist production methods. Ultimately scope economies are required to dissolve into scale economies for this to happen substantially in a harshly competitive global market. So, definitionally we may conclude, realistically, that the ultimate aim of LP in the West(as in Japan) is to cut costs. LP can be defined as a sophisticated cost-cutting philosophy....because it requires ever improving quality, innovation, supplier performance, worker flexibility, etc. with continuing reduction in costs."

Like in the case of Systemofacture, the protagonists of lean production put forward a systemic view of it as the optimisation of all activities in a value chain—the full range of activities that are required to bring a proudct from its conception, through its design, its sourced rawmaterials and intermediate inputs, its marketing, its distribution and its support to the final consumer. In other words, the value chain can be seen as incorporating production, exchange, distribution and consumption "from the cradle to the grave of a given product or service" so to speak (Kaplinsky,1998). As Hines (1994) says, the logic is that "companies jointly identify the value stream for each product from concept to consumption and optimise this value stream regardless of traditional functional or

corporate boundaries." Thus, according to Jones (1990, cited in Cooke:1993, and in Hines,1993), a chief protagonist of lean productin, the essentials of lean production cannot satisfactorily be implemented either piecemeal or in isolation from each other. They are "only fully functionable when all elements are in place and working together." Thus, the various elements of LP as an intra-firm as also inter-firm system are:

- it is customer driven, not manufacturing (i.e.supply)driven
- simultaneous engineering
- Just-in-time production and inventory control
- Stable production volumes with a great deal of flexibility
- Total quality control
- Kaizen(continuous incremental improvement
- Team work at all levels
- The organisation is horizontally and not vertically oriented;whereever possible responsibility is devolved to the lowest level possible, in the plant or the suppliers
- Integration of suppliers, manufacturers and dealers, dealers and consumers based on active mutual feedback of information
- All activities are organised and focused on a product line basis with functional departments playing a secondary, servicing role; the activities are coordinated and evaluated by the flow through the team or plant, rather than by each department meeting its plan targets in isolation
- A high level of information exchange between all actors and a transparent and real cost structure
- The whole system involves fewer actors all of whom are integrated with each other(engineers, employees, suppliers, dealers)
- All relations with employees, suppliers and dealers are based on reciprocal obligations(cooperative relations) that are the result of treating them as fixed costs(long-term assets

The term 'Sophisticated Cost Cutting Strategy' that we used earlier, borrowing from the insight given by Cooke(1993), to categorise the competitive strategy governing the use of lean manufacturing, is due to the ways, in a "management-driven, worker-led production process", costs are cut by means of productivity increases through, what is surprising at first, quality improvement and waste elimination by using Japanese manufacturing techniques or organisational practices in the name of Just-in-time production (JIT), Total quality Control/ Management (TQC/TQM), and Kaizen (Continuous Improvement). These techniques are also known as "soft management technologies". There are a number of specialist and non-specialist writings on these manufacturing methodologies (e.g. Schonberger, 1982; Hoffman, 1989; Humphrey et al.,1998a).

Quality improvement and waste elimination as never ending objectives constitute the two most fundamental, highly interrelated unifying themes of Japanese style manufacturing.

Under TQM, quality is defined by the needs of the customer as also the elimination of the causes of defects, instead of the

conventional definition of quality as conformance to standards. The concept of customer is broad. While the final retail customers are the ultimate arbiter of quality through their buying decisions, every worker at every stage in the production process is both 'customer'(of the output of the previous stage) and 'supplier'(of inputs to the next stage). Each supplier must strive to satisfy the quality demanded by each customer in the production chain internal to the firm. TQM trys to smash the classic quality-cost trade-off. Thus, the first fundamental proposition is that continual quality improvements in quality lead to continual improvement of productivity and the reduction of costs. This is captured as follows:

"Quality is achieved by improvement of the process. Improvement of the process increases uniformity of output of product, reduces re-work and mistakes, reduces waste of manpower, machine-time and material and thus increases output with less effort....Defects are not free. Somebody gets paid to make them and it costs more to correct them than to make the product in the first place...From 15 to 40 per cent of the manufacturers' costs...is for waste embedded in it—waste of human effort, waste of machine time, loss of accompanying burden.

Reduction of waste transfers man-hours and machine-hours from the manufacture of defectives into the manufacture of additional good product...the capacity of production line is increased. The benefits of better quality through process improvement are the long-range improvement of market position, greater product quality, much better profit, and improved morale of the workforce because they see management is making some effort themselves, and not blaming all faults on production workers."(Deming, in Hoffman, 1989).

Further, the costs of not ensuring quality "right first time"—'at the source'— are found to be staggering. Thus, 'quality at source' means problems that cause defects are much more cheaply and effectively dealt with at the point of origin rather than later via inspection, rework and field correction. Lastly, TQM is a company wide effort:

"Defects can arise at any point in the production process—design, materials, machinery operation, poor training of operators, packaging, movement and sale of final goods. Thus, all staff and all functions must be involved in the prevention and correction of defects and the improvement of quality, with two groups frequently singled out for special emphasis—line workers because they know the production system and can identify causes of defects better than any one else; and design engineers because manufacturability is seen as a quality and therefore a design issue." (Hoffman,1989).

Design for manufacture is said to account for one-third of cost savings of firms using lean production; it has the dual objective of reducing costs(e.g.by designing components which are easy to assemble, or products which are made up of fewer components) and of making it less likely that workers would make mistakes during manufacture.

Concerning waste elimination is the second fundamental proposition that the elimination of waste reduces costs and improves productivity, the actualization of which happens through JIT production and inventory control. Waste is "anything other than the minimum amount of equipment, materials,

parts, space and workers' time which are absolutely essential to add value to the product." There are seven wastes, all of which generate byproducts that drive up costs and reduce productivity. The seven wastes(Hoffman, 1989) are : waste from overproduction, waste of waiting time,

transportation waste, processing waste, inventory waste, waste of motion and waste from product defects. The byproducts of waste, for example, in the case of overproduction are in terms of extra paper work, extra people, extra overhead, extra defects, extra machinery, extra interest charges, extra space, extra handling, extra inventory. The byproducts of inventory waste are (a) they generate costs—the opportunity costs of working capital and the costs of the space, labour and moving equipment needed to equip and store them;(b) products lose value as inventory through damage and obsolescence; and (c) they hide manufacturing inefficiencies(problem of poor quality, machine breakdown, etc.)

JIT makes low stock production possible through flexible production flow optimisation by means of (a) controlling production through pull;(b)variations in production made possible to closely follow variations in demand, and (c)shifting factory layout from 'functional' to 'cellular'.

Pull production means production at one stage is activated by demand for output from the subsequent stage in contrast to push production governed by the logic of maximising output at each and every workpoint. This operationalises the definition of JIT as "producing the right quantity with the right quality in the right place at the right time".

Variations in production reflecting variations in demand are effected through reduction in lot and batch sizes. Lot sizes refers to the numbe of parts that move between stages of the production process. The ideal lot size is one piece at a time—"single piece flow". Batch size refers to number of number of products produced before the set-up of the process is changed. Both lot and batch sizes are compressed without cost penalty by means of rapid machine change over:"Tool and line change over is short, through engineering 'quick change' capabilities thus making it economical to run small lots."(Hoffman,1989). Cellular layout refers to grouping together of machines performing sequence of different operations so that each part moves rapidly unlike in functional layout where particular operations are clustered together by department, and often by type of operation within departments in order to foster specialisation and to achieve high rates of machine utilisation. Cells can be of three types(Humphrey et al., 1998a). A cell is intra-functional when it covers a restricted area of operations(e.g. in a machine shop, casting shop or assembly area). It is semi-integrated when activities from a number of factory's functions are integrated(assembly, packing, testing, packing). It is integrated and most advanced when full needs of particular types of customers are met or in which different 'families of products' are produced.

The central points, at the end of the day, are: first, the classic trade-off of manufacturing between product variation and cost is resolved by making it more feasible to produce in smaller quantities, albeit within annual largeer volumes. This is what is meant by dissolving economies of scope within economies of scale; secondly, the critical success factor called speed of

response to customer orders is address through rapid throughput time(i.e. time taken for work-in-progress to pass through the factory); thirdly, there are 'systemic gains' to be reaped by exploiting the connections between JIT and TQM. For example, when small lots are passed quickly from one stage of production to another, defects are noticed more quickly and the 'workers' awarenenss of defect causation is heightened.' But conversely, the reductin of buffer stocks takes away the margin for error and raises the costs of quality deficiencies, forcing solutions to be found. It may be noted here, in passing, that "in the normal course of events, buffer inventories build up between stages and cushion the effect of production irregularities. Japanese managers eliminate these buffers. As soon as the system settles down, they deliberately remove buffer inventories and/ or workers...The result is a continual round of productivity improvement—and the relentless heightening of performance pressures on the workers."(Hoffman,1989; emphasis added.)

To conclude, there are three sets of innovations—in production flow, quality procedures and kaizen—to effect organisational restructuring within the firm. Each of these has a set of very specific techniques, the use of which may vary depending on the nature of specific production process. JIT optimises production flow through single piece flow, celluar production, rapid machine change over and production smoothing(line balancing). TQM uses techniques such as Statistical Process Control and Pareto Analysis. Kaizen,using techniques such as Deming Wheel and Ishikawa problem-solving fish-bone diagrams' strives to continuosly search for improvements in quality, stock reduction, rapid machine changeover and rapid throughputs. Since the opportunities for minor improvements can only be identified by direct production workers, their understanding is mobilised through small groups which go under many different names such as kaizen groups, quality circles, problem solving groups, zero defect groups, etc. Thus, on this count at least, that is, that lean production is unique in terms of "tapping the gold in the heads of the workers", there is no disagreement between the ideologues and detractors of lean production.

As regards the application of lean, The literature suggests that there exists a wide variation in the implementation of Japanese manufacturing techniques, which, in part, is due to the differences in production processes. The protagonists of lean manufacturing, however, have "evangelised' that it is a universally applicable best practiceand that it is not only inexpensive but also easy to adopt in the developing country context. Thus, according to Hoffman (1989), "Four aspects of the new practices provide strong apriori grounds for our hypothesis concerning their applicability in developing countries. First, ...most new practices are neither scale, product, sector nor function specific....Second,there is no mystery behind how these practices work. Indeed there are numerous 'how to' books that describe practically how firms should go about introducing the new practices. Moreover, most management consulting firms provide specific advice on the practices. In short, the new practices are cofifiable and accessible." However, studies show that the implementation is not easy, technical issue independent of the way social relations are managed within and between firms. It

may be noted, in passing, that barriers to implementation could arise in terms of labour supply characteristics, non-commitment of top management and/or middle management, adversarial industrial relations, small firms not having even the minimal managerial systems required to analyse processes and keep track of performance and costs, absence of managerial restructuring and proper policy deployment, etc. Moreover, the "all or nothing" approach fails to appreciate how piecemeal and selective adaptations are undertaken to yield significant results by firms to suit their local conditions or how innovative strategies involving upgradation of product quality and production techniques are combined with the low road treatment of labour(i.e. cheap labour strategy) in order to be competitive. Thus,there is no single correct way of implementing modernisation policies(Posthuma, 1991).

II.3 SUPPLY CHAIN MANAGEMENT

According to the protagonists of lean production, the supplier relations associated with it are based on"obligated relational contracting"(OCR) which is the best practice to be emulated in contrast to the adversarial "arms length contractual relations"(ACR) that characterize the supplier relations under the mass production model, under which suppliers are played off against each other and decisions are mainly on the basis of price differentials. Also called "network sourcing" by Hines(1994), OCR is the requirements of the customers' customers, viz. quality enhancement, cost reduction over time through reduction in waste, new product delivery and existing product delivery(i.e.intra and inter-company delivery process through which the end customer pulls products through the complete system of value adding chain). We may note that parts supply chain is the backward linkaged part of the value chain, excluding the sourcing of raw materials.

Network sourcing, as Hines(1994) points out, is characterized by:

1. Tiering structure and reliance on small-medium firms;
2. Few supply sources with single part sourcing within a dual sourcing environment;
3. Asset specificity (i.e.the degree to which suppliers make specific investments concerned with their ability to supply any one particular customer;
4. Low value added ratios at the assemblers and throughout the supply chain;
5. Bilateral design whereby suppliers play a major role through black-box parts provision;
6. Because of 5, there is supplier innovation (i.e. willingness of suppliers to come up with innovations and cost saving suggestions and to work collaboratively);
7. Relations are characterized by essentially informal contracts, closeness, shared objectives, information sharing and bilateral negotiations, whicha re combined with severe cost-down pressures (to which the suppliers respond primarily by industrial engineering and kaizen).
8. Institutionalization of competition through supplier grading, and working towards self-certification(i.e. removal of quality inspection at the supplier);
9. Supplier coordiantion(i.e.working toward common quality standards using the same paper work system, shared

transport, common inter-company communication methods such as EDI) to reduce inter-company waste through supplier cooperative associations which cascade down the tiering structure; and

10. Supplier development whereby assemblers transfer hard technologies as well as soft management technologies in order to reduce intra-company waste by means of changing factory layout, set-up times reduction, operation of internal JIT, etc.

According to Hines, the last two characteristics, which he says are typically neglected elsewhere, constitute the crux of the competitive advantage for the Japanese assemblers through their supply chain management.

It may be noted that while Hines points to the cascading of lean production techniques down the entire supply chain, Roper et al.(1997) refer to "little or no evidence about its operation in the supply chain, even in Japan", especially from the Tier II level onwards. Also, the above characterization may apply to the relatively larger subcontractors with specialist technologies and skills rather than to the low value adding (labour intensive) smaller subcontractors at the lower end of the supply chain. Further, while Hines suggests the existence of collaborative and harmonious relations between assemblers and suppliers in Japan,a number of critics(Turnbull,1988; Rainnie, 1991; Chalmers,1989; Oliver and Davies, 1990; Posthuma,1995), point to unilateral domination of the assemblers(with their strong market and negotiating power and non-negotiable requirements regarding quality, price and speed of delivery) and the ensuing conflicts in the context of fierce competition, especially in respect of price, not only in Japan but outside Japan where Japanese style supplier relations have been taking shape through the process of "fewer and closer" restructuring process. Thus here too we see the real world of hybridization of the 'exit' type(ACR) and 'voice' type (OCR) supplier relations. As Leimt (1997) remarks, "in this game in which so many factors (price, survival, competition, collaboration, dependence) play a role, only the strongest suppliers(in terms of finance and technology) will qualify for the first tier partnership." while many medium and small suppliers will find themselves discarded out of the selection process of the assemblers. Cooke (in IILS,1993), writing about the German engineering firms applying lean logic, comments thus:"The relationship sought by customer firms is described as 'partnership', but...firms see this as, in reality, a master-slave relationship. Automotive suppliers are...'squeezed like lemons'...the trust required of suppliers by LP customers (is)...comparable to the "trust asked by the snake of the mouse."

Finally, we may note that as is the case with most studies of buyer-supplier relations, Hines (1994) too is silent about the extent to which labour is treated as an asset in the supply chain, although he simply professes that supply chain integration also involves integration of "human resource policies, training and education". While supplier's competitive strategies (the way they intend to position themselves in the subcontract business) are largely circumscribed by the demands made by their customers, the key question that lean thinkers have ignored is: how do labour strategies change in leaning the supply chain?

II.4 IMPACT OF LEAN ON LABOUR

The tangible and intangible impact on labour

is complex, with both positive and negative consequences pointed out in the literature. Moreover, the diversity in employment relations associated with lean production suggests that changes in manufacturing practices do not mechanically determine them in a particular way. Which means that the diversity needs to be explained keeping in mind not only the variation in the implementation of JIT/TQC but also the labour market conditions and institutions. The existing literature mostly focusses on large end-product or component firms. This creates a bias in understanding the diversity in the supply chain. This study thus intends to fill in this information gap.

In their celebrated book on car manufacturing styles, the ideologues of lean production (Womack et al.,1990) write:"Lean production is a superior way for humans to make things...It provides more challenging and fulfilling work for employees at every level, from the factory to the headquarters." Thus, they suggest, without empirical proof, that labour's skills and the quality of work would be enhanced, and that labour relations would become more cooperative. According to Humphrey(in IILS,1993), there seem to be three reasons for upholding this belief:"Firstly, the new organisational forms are held to provide a better and more varied work environment...the methods create their own positive labour relations climate..Thirdly, it is supposed that new production methods which (1) rely heavily on workers to produce good quality at the right time,(ii)are vulnerable to disruption, and (iii) seek worker input into improvements to the productin process, can only be based on the active consent and participation of labour. Hence evidence of the methods being used can be taken as evidence of improved working conditions and labour relations."

In contrast to these claims, many critics portray LP workplace as "modern sweatshop" wherein the application of Taylorism is made to be done by the workers themselves. Thus the work organisation of LP is basically super-Taylorist. In this connection it is worth quoting a powerful criticism shared by many (Delbridge et al., 1992):

"A JIT/TQM system does, as the advocates are keen to point out, entail a devolution of responsibilities traditionally held by management to the level of team leader or operator; however, this does not lead to autonomy, rather an increasing(an increasingly taxing) set of tasks which are closely monitored and strictly controlled...The success of the JIT?TQM manufacturing system in terms of intensifying the labour process is a result of increased surveillance and monitoring of workers' activities, heightened accountability, the harnessing of peer pressure within 'teams' and via 'customers' and the fostering of 'involvement' in 'waste elimination' and the continuous improvement of the production process."

This type of labour regime can be combined with labour policies which (1) deny workers effective collective action, through marginalisation of trade unions or union avoidance or their recognition on terms which inhibit protest, and (ii) identify the extent of workers' involvement and provide clear rewards and penalties. Thus both vulnerability of such systems to disruption and a degree of worker involvement/ compliance could be obtained(Humphrey, in IILS,1993).

The issue of 'multiskilling' as a benefit to labour is subject to different interpretations. For example, a demystifying interpretation,

even in the Japanese experience, as given by Naruse (1991) is as follows:

"The multifunctional worker concept does not imply a skilled worker, as in the age of general machinery, before assembly-line production.....Making a line worker multifunctional in the Toyota system means only training him in improved work methods. In other words, his work itself is essentially unskilled or semi-skilled, not multi-skilled, but he is required to be multifunctional so as to improve work methods and to be a labourer of his workgroup."

In their study of skills requirements of the high performance work systems of lean production, Cappelli and Rogovosky (1994) arrive at the following overall conclusion:

"the most common skills encouraged by new work practices are behavioural ones, such as working in teams...although new work practices may make greater demand on workers' technical skills, these demands may not be overwhelming and the practices may, indeed, focus more on behavioural than traditional vocational skills. The fact that the Japanese car companies can take inexperienced workers in the US and the UK and produce cars more efficiently than the German companies in Germany with a much higher skill base suggests that the skills required by lean production can be taught relatively easily. While new production systems require workers to learn about concepts such as continuous improvement, and statistical process control, in particular, concerns behavioural skills or socialization".

It is interesting to note similar findings by Posthuma(1997) in what is perhaps the first research project, in LDCs, about skills in the auto supply chain. Her study in Brazil proposes that the position of a firm in the value adding chain has a direct impact upon the opportunities for skill enhancement. The first tier supplier firms spent relatively more in training than smaller firms down the supply chain. However, there were limits to following the high-road even in the first tier due to the cost cutting pressure from the assemblers; the continuous fear of low cost imports squeezing the financial resources undermines expenditures in training and improved workplace conditions. The training courses administered by companies were mostly literacy and behavioural/attitudinal courses, typically including ideological issues such as worker participation, total quality culture, housekeeping of individual work areas and concepts of team work. Technical courses were generally designed for technical staff or management in order to improve their specific skills in areas such as financial decision making, production control modelling or strategic marketing. The training approach of the firms seemed to have the effect of polarising the skills. Those workers with better skills continue to have additional opportunities for technical training while unskilled and semi-skilled workers do not receive opportunities to either upgrade skills or apply them in the workplace in more polyvalent work structures.

Just-in-time links with assemblers require a great deal of labour flexibility from subcontractors, which in turn promotes precarious forms of employment in a context of fluctuations in demand and unpredictable production or work schedules even as delivery period are increasingly designated by days or even an hourly basis. Chalmers(1989) captures this as follows:

"In these circumstances subcontractors are obliged to carry inventories in anticipation of orders and to have an 'inventory' of

labour effort—a fluctuating workforce—to meet changes in demand. The economic viability of carrying inventories on behalf of the orderer decreases as subcontractors become smaller in scale or closer to the perimeter of a network. It is then likely that they must resort more frequently to the use of available and dispensable labour to speed up the pace of work, slow down or suspend operations as an alternative to carrying stock inventories. Thus, non-regular workers find their employment more insecure. Even core workers are at other times are laid off or work for reduced hours. Their monthly wages are frequently calculated on daily or even hourly rates to allow for irregular employment, though they may not be classified as casuals or day labourers."

A hypothesis that could be explored is that elements of internal JIT (i.e. intra-firm JIT production) could be applied in the supply chain, not only with atypical andundervalued labour but also functionally flexible and doubly numerically flexible labour—i.e. numerical flexibility(with freedom for employees to adjust the size of workforce and also with freedom to adjust working hours of existing workforce. That this is the case even in a large(end-product) firm in a greenfield site in India has been analysed by Vanamala (1998).

In the context of tight interface with suppliers, labour relations in the supply chain could be a matter of importance for the assemblers, especially in relation to single sourcing. Oliver and Wilkinson(1992) point out that customers extend their influence to cover the industrial relations policies of suppliers as well by selecting primary suppliers based on criteria including industrial relations, trade union structure, working practices and strike record.

Unions are unlikely to be found beyond the first tier. Even if thery were to be there, they will have no influece at the plant level unless worker representation is organised from the beginning to the end of the supply chain. The tighter the relations between the firms in the chain becomes, the less the room there is for negotiating labour conditions, which are basically derivative of the labour managment negotiations at the final stage where the assemblers have the prerogative of setting the production schedule of the whole subcontracting system (Kuriyama,1990). Managements in supply chain will lose their sovereignty as well and this may provide labour management cooperation to survive competition, as Sydow (in IILS,1992) argues. It is interesting to note what a manager in a supply chain commented thus (IILS,1993):

"Companies are pushed around by the market, and in this we are in the same boat as the unions. I work in an industry where,when we are successful, we make agreements with the original equipment manufacturers and we agree on the price of a product. But the contract says that this price will go down 5% next year, 5% more the following year, etc. In negotiations with unions, we cannot guarantee anything and instead we should explain that our energies should be best directed at making a few things happen, such as being able to deliver an increasingly good product at an ever lower price."

Finally, we may note the conditions under which labour conditions could be better in the supply chain, especially in the smaller firms. These conditions may not be there in most LDCs. Schmitz (1992), observing a collision of the small and large firm structures in heirarchical clusters of car and electrical/

electronics industries in Germany, points out three requirements as a hypothesis for labour to be treated as a resource to be developed over time rather than a cost item to be minimised in the subcontract network:(1)the contribution of industrial unions in accelerating innovation process by emphasising training, skills and innovation; (2) the role of sectoral associations in providing services with respect to technical matters and advice on labour issues such as rights and obligations toward workers and (3) joint action whereby small firms do not have to bear the entire burden of(a)developing new technologies, (b) finding new markets, (c) training skilled engineers and workers and (d) raising capital.

III.RESEARCH OBJECTIVE AND QUESTIONS

Given the objective of this study, as one of exploring, describing and understanding the patterns of supplier relations, manufacturing practices and labour strategies in the supply chain in the Indian Automotive context, the central questions are:

I. Inter-firm Relations

How have inter-firm relations changed, with the changing basis of competition in the post-liberalisation context, in the auto component supply chain? Does the trend toward "fewer and closer" supplier restructuring affect all units down the supply chain?

How have these changing relations impacted on the modernisation policies(i.e. technological and organisational upgradation) of the supplier firms?

2. Modernisation Policies

To what extent and in what production processes have the new flexible technologies been applied? For what purposes or reasons are they used? What are the benefits obtained? What are the major constraints on their diffusion in the supply chain?

To what JIT purchasing permeates the vertical inter-firm relations down the chain? To What extent JIT/TQM practices are applied within the firms? What is the relationship between the former and the latter questions? What are the benfits and difficulties experienced in this regard?

3. How have the labour strategies changed in terms of policies and practices concerning (a) work organisation; (b)employment security and staffing arrangements;(c)skills, training and motivation;(d)compensation methods and working conditions; and (e)union/ non-union labour-management relations?

4. What are the behavioural and attitudinal responses of the employees to the employer strategies in the supply chain?

IV. RESEARCH METHODOLOGY

The questions posed above would be examined through (a)an exploratory, descriptive and explanatory multiple case study as the research strategy; (b)business organisation as the unit of analysis; and (c) multiple methods of data collection. The reason for choosing supply chain is that it permits us to see patterns among large, medium and small firms.

The multiple case study approach suits the purpose of examining somewhat in detail the patterns of change processes for generating analytical generalization rather than empirical generalization through a large-scale survey based survey based on sampling procedures.

As Humphrey et al.(1998a) point out, the survey does not suit the following questions to be anaswered: Why do some firms change more effectively than others? Why is change possible in some cases, and not in others? What determines the pace of change?

In the empirical literature concerning the adoption of new technologies and Japanese style intra- and inter-firm organisational practices and employee responses to them, one finds the use of case study or survey or combinations of both or rarely even experimental method, depending on the purpose and unit of analysis of the writer concerned along with multiple methods of data collection in most cases.

A case study refers to the investigation of a single case or a relatively small number of naturally occurring (rather than researcher created) cases whereas a survey is defined as the simultaneous selection for study of a relatively larger number of naturally occurring cases. However, there is really no clear cut notion of "how relatively small" the multiple case study could be vis-a-vis the survey. Further, as Hammersley(1992) argues, the distinction between case study and survey is actually a matter of degree, and "it involves a trade-off between the likely generalizability of the information obtained on the one hand, and the detail and accuracy of data about particular cases on the other. And the position along this dimension depends on our goals and the resources available to us." A criticism against the survey is that answers people give to questions may not be true but this may equally arise in the case study. A well-accepted potential weakness of case study is that its findings may be exceptional or unrepresentative of the universe of cases. This weakness can, however, be moderated by selecting cases in such a way as to cover some of the main dimensions of the heterogeneity in the population of cases.

Having taken that, there are two important questions that will have to faced and for which there is no a priori answer. These are: How are the cases going to be selected in the parts supply chain? How many cases are to be investigated?

The components sector is very heterogeneous comprising hundreds or thousands of firms which span across a wide range of products, production scale, materials used, markets served, etc. Most of the component firms are diversified by product type,and clientele. And a significant section of them also serve three principal markets, viz., (1) the after market which is composed of retail outlets and authorised mechanic shops which sell replacement parts to vehicle owners;(2) original equipment which includes parts and components that are sold directly to the vehicle assemblers, also referred to as Original Equipment Manufacturers(OEMs); and (3) the export market which includes parts which are sold directly to the after market and OEMs overseas, as well as indirect exports which are either sold by a subsidiary components firm to its parent firm overseas, or exported by the Indian OEMs in built-up vehicles. Component firms producing solely for the domestic after-market are not relevant for my study.

The Indian Automative Industry Buyers' Guide 1998 as brought out by the Automotive Components Manufacturers Association (ACMA) of India, gives a list of large and medium(by employment size) auto component firms, mostly concentrated in the Northern, Western and Southern regions

of the country. The small firms are said to be "invisible" and expected to exist at the Tier III level of supply chains. Thus, they can only be spotted with the help of field investigations with Tier II level subcontractors.

In order to track down the supply chain and select the cases, a top-down approach can be used whereby a lead car firm can be contacted for identifying its Tier I suppliers, and through them the Tier II, Tier III, and so on down the supply chain in a single product group out of several groups such as engine parts, electrical parts, drive transmission and steering parts, suspension and braking parts, equipments, body parts and others. An added advantage of this possibility is that the dynamics of make-buy policies and the final phase of car manufacturing at the lead firm could be excamined.. In order to allow for the heterogeneity among the auto parts firms, the same process can be repeated in respect of some other or all product groups, depending on the depth of the chain in each product group, and the time constraint affecting the field study.

Access will have to be gained to atleast a minimum of 25-30 firms that vary by tier level within and across product categories. In selecting these units, a primary consideration would be whether the unit is atleast linked to other units through JIT delivery.

The primary field data—quantitative as well as qualitative— would have to be collected through multiple methods of data collection such as inspection of firms' own documentation, collective agreements, union records, plant visits and direct observation of shopfloor activities, formal and informal interviews/discussions with the relevant "key informants" inside and outside the workplaces. The data collection techniques may vary depending on the position of the case unit in the supply chain. The objective is to reduce respondent errors and bias by covering all relevant perspectives of all levels of management, union representatives, engineers, technicians, shopfloor workers, government officials(e.g. at the Assistant Labour Commissioner's office) and the officials of the industry and tier-based supplier associations, if any. In this connection, that the case study approach is "more of an art than a science" with "lack of well-established protocols", and "many potential trappings for the unwary" in accessing the gatekeepers of information and capitalising on the snowball effects through them, is well brought out to our notice by Kitay and Callus (1998).

There are two major problems in conducting this research. The first one concerns the personal insecurities that develop around seeking access and fearing rebuff. Formal permission for study is next to impossible to get and no management can give access to official records (Ramaswamy, 1988), and freely talk about the sensitive aspects of their supplier and labour strategies. Thus, the rigorous study in India, by Humphrey et al. (1998) is exceptional in that they could get unlimited access to the top management of the Crompton Greaves company and to the managers of its suppliers. Secondly, how to investigate workers'views, especially in the absence of unions in much of the supply chain? Juravich (1985) points out the ethnographic participative observation as the best way of understanding labour process and worker perceptions; the world of shopfloor workers is so different from the middle class professional world that it is difficult to understand without first hand experience of the "thickness" of the

everyday factory life. In this sense, it is extremely difficult for survey or case study researchers to know what kind of questions to ask or even how to frame questions properly. While Juravich is right in the purist sense, there are good studies built upon indepth interviews with workers. Covert or overt participant observation for 1-6 months as some researchers have done in the West is not possible in the Indian context. Therefore, workers will have to be contacted outside plants or in their homes. Individual and panel discussions with them would be useful in understanding the nuances of shopfloor relations (labour control mechanisms) and gathering data regarding working conditions. Interviewing small industry workers in groups may be counterproductive, and so one-to-one interviewing is desirable since some employees can act as surveillance agents for employers. Towards the end of the fieldwork, a structured questionnaire would be administered to extract employee responses in units where new production practices are significantly used.

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