

Weaving Flexibility: Large-Small Firm Relations, Flexibility and Regional Clusters in South Korea*

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1. Introduction

Since the mid-1980s, South Korea's industrial system has been subject to an immense pressure on its restructuring towards a technologically competitive regime of production. Diverse social actors are, under the conduct of the state, involved in orchestrating new social dynamics for re-industrialization. In the social organization of the new economy, new inter-firm relations appear to be highly effective in overcoming the technological, financial and marketing problems on the way to high industry development. The axis of the new inter-firm relations has been once again built along the relationship between large and small firms. This is Korea's unremitting political economic tendency resulting from the domination of a handful of conglomerates in a national economy. However, as micro-electronic based process technology spreads, new production relations tends to be more flexible. Flexibility is

generated, by and large, by the sectoral as well as spatial clustering of new inter-firm networks woven around technologically interconnected processes of production.

With this background, this study seeks to explore the form and function of new inter-firm relations which act to create a grounding for a flexible production system. Focusing on large-small firm relations, the study analyzes three types of regional clusters of corporate networks. Each cluster is assumed to represent one of the three techno-spatial ensembles constituting Korea's new industrial system. At a micro level, analytical emphasis is placed on unravelling the mechanisms underlying the clusters conducive to flexibility and collective efficiency. In so doing, the study is implicitly addressed to a critical examination of the theoretical validity of the so-called flexible specialization thesis for countries like Korea.

2. New Facets of Korea's Industrial Development

1) A Shift towards High Technology Industrial Development

In South Korea (thereafter, Korea), full-fledged capitalist industrial development commenced with the rise of a military government led by General Park in 1961. Since then, Korea's industrial development has

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grown at unprecedentedly high-speed rates. In spite of its short span of history, however, the Korean development is said to have undergone three distinct phases of paradigmatic restructuring (see Cho, M.R., 1991a).

The first phase occurred between 1961 and 1972. During this phase, the planned intervention by the state to economy set out, with an effect of moving a national economic foundation away from agriculture towards manufacture. Simultaneously, as an export-oriented strategy was gradually adopted, emerging manufacturing activities were centered on the production of labour-intensive exportable consumer goods like textiles and shoes. However, to a considerable degree, the lack of an integrated industrial basis greatly undermined the potential of such industrial growth as planned.

The second stage began with the launching of a large-scale heavy and chemical industrialization project by President Park in conjunction with the formation of a bureaucratic authoritarian regime in 1973. The major effort of the state was devoted to the making of new capital-labour relations in the new strategic industries like steel, shipbuilding and heavy chemicals. It was during this period that the core of Korean economy was solidly founded on a modern manufacturing system and, more importantly, that a number of conglomerate business groups called Chaebol in Korean came into being. But, on account of heavy dependency on foreign sources of capital, technology and market, new capital-intensive activities formed scant relations with the traditional and endogenous sector of economy. Lacking internal integration and autonomy, this structure, hence, was intrinsically susceptible to the crisis tied to external

fluctuation.

The third phase set in by the mid-1980s, under the situation of putting pressure on a shift towards high technology industrialization. Here, the stimuli stemmed from two main sources: one was the repulsion from the existing production relations based on cheap labour; the other was the attraction into the production of technically competitive goods. For the former, domestic factors were dominant: typically, the 1987 labour dispute (see the next section). For the latter, international factors were prevalent: typically, international pressures on the appreciation of Korean currency and the opening of Korean domestic markets, and the gradual end of so-called Three Low Phenomenon which enormously expanded the export of cheap products.¹⁾

All these developments have contributed to drawing forth a new drive to investment in high technology industries. Indeed, the economic performance in general during the later 1980s turned out to be highly enterprising, as one can imagine from the very high rates of fixed capital formation, private consumption and economic growth (see Tab. 1). However what was more than this aggregate performance is that there has emerged a new wave of industrial expansion spearhead by electrics/electronics, precision machine tools and transport equipment. Importance of this change lies particularly in the following: as high technology like electronics, mechatronics and precision chemicals²⁾ sweeps through Korea's industrial production system, an extensive industrial restructuring has taken place, with the proclivity for emergent industrial relations to be rendered more integrated and more flexible.

Table 1. Major Indices of the 1980-89 Korean Economy

	%									
annual growth rates/years	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
economic growth	-4.8	6.6	5.5	11.9	8.4	5.4	12.9	12.8	12.2	6.7
fixed capital investment	-10.5	-4.0	12.9	17.1	10.7	4.4	10.9	17.4	11.8	16.2
private consumption	1.4	3.2	4.8	7.5	6.0	4.9	7.8	8.4	9.6	9.8
export	10.2	15.0	6.5	15.5	10.0	2.1	26.6	23.7	14.7	-6.3
import	9.6	17.2	-7.2	8.0	16.9	1.6	1.4	29.9	26.3	14.0
retail prices	28.7	21.6	7.1	3.4	2.3	2.5	2.7	3.1	7.1	5.7
whole sale prices	39.0	20.4	4.6	0.2	0.7	0.9	1.5	0.2	2.2	1.5

Source: Economic Planning Board, *Korea Economic Statistics*, 1980-1989.

2) Flexible Inter-Firm Relations

In an emerging industrial economy, new industrial dynamics revolve largely around the production and consumption of new products, notably durable consumer goods such as motor-vehicles and electric/electronic appliances. In a capitalist economy, the social production of new commodities requires a presence of their corresponding productive forces and social relations. This suggests that the conditions for high technology products are to be socially provided and met. Using the term of conventional economics, the conditions refer to those that enable the correspondence of demand and supply. Interestingly, a new demand-supply match for new products within a national economic system began to be exacted, among others, particularly by the nation-wide labour dispute in July and August in 1987, the period now called Hot Summer.³⁾

With regard to demand, the 1987 labour unrest has brought about the strengthening of bargaining power leading to a rapid rise of wage: real wage soared to 219.3 in 1990 when 1985 set as 100, very high compared to 113.6 for the U.S, 116.3 for Japan and 174.6 for Taiwan. High wage changes

customers' taste, as basic needs are increasingly satisfied. On the other hand, externally, tougher price and quality competition in world market, together with a strong international demand on the opening of domestic markets to competitive foreign commodities, has made it pressing to upgrade technical/quality inputs to Korean products. All these come to arouse the demand for more diverse, flexible and niche-oriented products.

With regard to supply, volatility and flexibility in demand induce suppliers' response of a similar sort. Yet, this motive tends to be bound up with the desire to bring labour processes under more flexible capitalist control. The outcome is the production reorganization which is widely undertaken across industrial sectors, as indicated by the rapid diffusion of so-called Factory Automation or Flexible Manufacturing System as a comprehensive embodiment of new high technologies like micro-electronics and mechatronics: the rate of Factory Automation (=automated units of production/total production units) in manufacture has gone up from 30.8% in 1986 to 45.3% in 1992.

Enacted by the correspondence between flexible demand and supply is a deepening of broad integration, via a complex input-output matrix, of

production, distribution and marketing. This integrative circuit works through the flexible synchronization of material and informational flows among the units involved in a new social division of labour. Underlying this process, hence, is an integrated networking of technically and functionally specialized agents/work-places/firms, from which collective flexibility is derived.

In essence, networks become an important facet for the emerging production system. Since key social agents of creating the networks are firms, the networks take the form of inter-firm cooperation, alliance, affiliation, subcontracting and the like (Sayer and Walker, 1992: 129-140). As well known, Piore and Sabel's (1984) flamboyant exposition of the flexible specialization model has brought into light the small firm networks of Italy's industrial districts. In comparison, the Korean model of inter-firm networks must be understood with a point of departure in large-small firm relations, chiefly because of the domination of a handful of conglomerates in national economy⁴⁾, a situation which compels small firms to become either dependent on or functionally affiliated to large firms. However while large firms branch into new industries like automobiles and micro-electronics, large-small firm relationships develop into much more organic and flexible networks in which large firms depend on small firms to perform specific tasks. In other words, new large-small firm networks act with a dynamic of flexibility, serving the sharing of specialized competences between large and small firms, that is, large firms' technology, innovative capacity, financing, market outlets and small firms' niche-based technical skills, batch production, flexible

labour/wage relations.

Large-small firm relations usually takes on a form of subcontracting. For an indication, the proportion of small subcontracting firms in manufacture expanded from 30.0% in 1980 to 59.1% in 1988. In 1988, 75% of small firms in the metal assembly and machinery equipment sector were subcontracting firms: 82.9% in electrics/electronics and 80.5% in transport equipment. In all industries, 80% of all small firms produced over 80% of their total output in sale price under subcontracting in 1988. In 1991, it was reported that 1,100 large lead firms held various supply-demand channels with 12,500 small firms and, to deal with the matter of the collaboration and cooperation among these firms, 102 associations or councils were in operation.

3) Techno-Spatial Clustering

A central driving force of recent industrial restructuring evolves out of technical and organizational changes in the large firms affiliated to conglomerate business groups, that is Chaebol. From the early 1980s onwards, most of conglomerates have sought to turn their major thrust of production to high technology industries, with a help of government policy supports and with foreign technologies introduced through multinationals. Among the internal measures undertaken to this end, the most comprehensive is the so-called systematization of enterprises' which means the combining of existing firms in a mutually connected line of business, via merge or re-setup, into a production regime especially for hi-tech commodities.⁵⁾ This mode of internal reorganization has created, in the course of its working, several crucially inter-related effects.

The first is an effect of system change. As leading enterprises move up the technological ladder, their associated or even remotely related small-scale business is enforced to follow suit. Attendant to this on an aggregate scale is the shift of the central apparatus of a national industrial system from the 60s labour intensive industry (typically textiles), through the 70s heavy and chemical industry (typically machines and chemicals), to the 80s high technology industries (typically electronics). However, this shift has proceeded by involving the restructuring of existing industrial system. In fact, the industrial restructuring under way since the mid-1980s has gone through the concurrent change of three techno-industrial sub-systems: (1) the promotion of new high technology industries like micro-electronics and mechatronics (2) the expansion of capital-intensive mature industries like motor-vehicles (3) the rationalization of traditionally labour intensive industries like textiles (Cho, M.R., 1991b). Each of the three sub-systems corresponds to the upper, middle and lower levels of the technological hierarchy of Korea's current industrial system respectively.

The second is an effect of industrial linkage indicating that, as large firms produce new commodities in need of numerous parts or components (notably machine assembly and transport equipment), this creates the demand for large firms' dense cooperation with new small firms which supply those parts and components. This situation has prompted a plethora of new small firms to come into being, most of which are, in one way or another, integrated into the new hi-tech production circuit under the influence of large firms. As of 1990, more than

60% of all existing enterprise are those established between 1981 and 1990. Given that large firms are only 1% of them, it is conceivable that substantially all new firms fall under the category of small enterprise. Sectorally, the bulk of new small firms are engaged in the yield of parts and intermediate goods, such as metal assembly, machinery equipment and industrial chemicals.

At a corporate level, the above two effects are combined to have their repercussion on the new qualitative aspect of inter-firm relations. As implied earlier, the production of new products in large firms runs through new complicated but fragmented processes which demand not only a re-demarcation of jobs along technically different lines within a firm, but the enhanced externalization and specialization of production-process among technically different firms. In general, however, an all-embracing trend is oriented to the deepening of social production from intra-firm demarcation into inter-firm externalization. The externalization is usually established through subcontracting networks between large and small firms.

Yet, the ways in which the production of large and small firms is brought into an integrative network vary across industrial sectors. This is largely for the reason that each (sub)sector commands different technological, labour and market requirements for the externalization of business. A pack comprising these requirements is the locality in which various conditions have been embedded during the last phase of industrial development, but on which, with a new round of industrial activities, new inter-firm networking is superimposed. In all, these industrial and geographical conditions forge the clustering

of inter-firm relations which are sectorally as well as spatially distinctive.

Since the mid-1980s, in effect, from the three-tier industrial changes have emerged three archetypal techno-spatial clusters which are brought together to shape the techno-spatial complex of Korea's new industrial system: (1) Seoul metropolitan region for high technology like micro-electronics (2) Ulsan industrial town for middle technology like motor-vehicles (3) the city of Daegu for lower technology like textiles. In what follows, a detailed analysis is made about each of the three clusters.

3. Three Regional Clusters

1) Micro-electronics and Seoul Metropolitan Region as a System Area

Since the beginning of the 1980s, the possibility of high technological industries has been experimented, under the initiative of large firms, mainly around the Seoul metropolitan region. This is entirely the 1980s' techno-spatial phenomenon discernible solely in the Seoul metropolitan region, and so it is not an accident that this region is the site of accommodating the bulk of new hi-tech production: today about 81% of hi-tech industrial plants locate in this region (Park, 1991). Among the high technology industries in the Seoul metropolitan region, particularly predominant are micro-electronics, as shown by the fact that in 1989, 86.4% of semiconductors, computers and softwares were produced in this region.

Korea's electronics started with the labour intensive assembly of imported parts by using cheap female labour. But, thanks to the massive investment

concerted by the government and private conglomerate firms, some sector like semi-conductor production has ascended to the third position in the world behind Japan and the U.S. In these days, micro-electronic technology permeates through all branches of industries, to the effect that the mechatronics like NC, CNC, CIM, CAD and robots emerge as the most promising field of high technology industries.

The commanding height of micro-electronics industries is the large conglomerates which internally have a vertically integrated network linking closely R&D, parts supply, assembly and marketing. An typical case is Lucky Gold Star Group, the third largest conglomerate business group in Korea. 23 of the 48 firms of this group are engaged in electronic industrial business and their produce covers virtually all spectrum of electronics goods, ranging from semiconductor, computer, T.V. audio, telephone to software, robot, aerospace. Each firm operates its own internal division of labour according to Taylorist principles (I: design and O&M, II: skilled machine manufacturing, III: unskilled execution).

More important under their conglomerate structure, however, the intra-firm divisions of labour are vertically integrated into the extended inter-firm division of labour. In other words, the work units of an individual firm seem to operate within an independent corporate organization, but their technological, financial and commercial activities are strongly tied together via an integral managerial circuit of the conglomerate. This combination at a group level gives rise to a macro socio-spatial division of labour, in which, the upper function like R&D, hi-tech production tends to be concentrated in

the metropolitan region, with the lower function like assembly, unskilled execution in peripheral regions.⁶⁾

As a matter of fact, Lucky Gold Star Group has many work units of leading micro-electronic enterprises in the Seoul metropolitan region. Included are, to name but a few, Gold Star Central Research Institute, Gold Semiconductor Co., Gold Star Industrial Electronic Co., Gold Star Machinery and Electronic Co. Major products of these firms are telecommunication equipment, precision machinery, aerospace, robots, FMS and the like. Within the technical division of labour on a group scale, most of these firms operate at a level of highly innovative technologies.

These hi-tech enterprises have been established in various ways, such as split-up, merge, take-over and joint venture. But the internal channels of the group regulate strongly the sharing of finance, know-how, machinery, materials and sale outlets among them. Externally, they often seek to build a strategic alliance with foreign technical firms (mainly from Japan), university or government-run research institutes and, in some cases, other conglomerates. Through this alliance, they intend not only to acquire innovative technology, know-how, hi-tech components, but also to keep hi-tech commodity markets under their monopolistic control. This kind of alliance is often politically protected and closed off to outsiders.

In the actual production sphere, most plants have been extensively reorganized particularly after the nation-wide labour unrest of 1987. Major production lines are now equipped with varied flexible manufacturing systems like CN and CAD and it follows from this change that shopfloors are renovated in such a

Japanese fashion as to maximize the incorporation of humanware. As regards inter-firm relations, the essential feature of the reorganization is twofold. One is the reshaping of existing Taylorist labour processes through innovative technical enrichment, job re-demarcation and re-arrangement. The other is, as coupled with the above internal change, the externalization of production processes which are either sensitive to labour cost and disruption, or dependent on technical contributions from other firms.

At this level of production reorganization is the fabric of inter-firm relations woven most thickly and this is especially noticeable in the sector of electronic assembly such as computer, video and audio. With this level of productive technology, not only is the technical know-how invented by the above strategic alliance translated into the practical organization of production execution, but specialized competence of a myriad of small firms is also incarnated into final commodities. The latter comes into effect generally through large-small firm subcontracting relationships.

The contractor-subcontractor relationships in micro-electronics are, by and large, mediated by a collaborative association which large lead firms form with hundreds small firms. For Lucky Gold Star Business Group, the association named Seong-Ryuk-Hoe (or Star Power Association) plays a critical role in accommodating and administering subcontracting affairs in the group's all business branches. The number of sections of the Association increased from 52 in 1983 to 183 in 1988. A 1989 survey about a Gold Star video assembly plant in Seoul suggests that the firm holds diverse types of subcontracting

relationships with 223 small firms at the point of the study, of which 87.2% locate in the Seoul metropolitan area, and also that 43 of total subcontracting firms are designated as 'Linkage Firms' and 51 firms are the members of the Association (Lee, Y. S., 1989).

There are some private associations, yet many of them are in effect formed in line with the state policy which promotes industrial linkage in designated sectors.⁷⁾ Hence, in most cases, subject to state regulation, the transaction with subcontracting firms carries some legal responsibility for securing the interests of these firms on an equal contract base. Apart from legal obligation, the operation of high technological production system per se claims large firms to make much of the partnership of small subcontracting firms, for it is more apparent that small firms produce specialized goods and services that large firms cannot afford to do internally for various reasons. In fact, improvement in the technical role of small supplier firms is considerably owing to a variety of technical and financial assistances that large firms extend to them in line with the new acts for promotion of small firms. As the role of small firms upgrades, new large-small firm relationships become more associational and collaborative in nature, though many of them still hierarchical and vertical. In all, a new type of large-small relations in micro-electronics is such that small functional and technical firms are, each with its own contributory specialty, (quasi-)horizontally clustered (or disintegrated) around the core of large lead firms.

On the down side, the limbs of micro-electronic production reach, down along hierarchical layers of

subcontracting, to the workplaces where piecework is carried out by hundreds of thousands of housewives or the elderly for low wage. The tasks they carry (typically, wrapping various sizes of inductors with coils) constitute the lower segment of labour intensive production which is put out by subcontracting small firms. Hence it is possible to state that they are, via a complex sub-network of small firm production relations, functionally integrated into a hi-tech production regime led by conglomerate firms.

Such a role of small firms also cut cross the networks which unify producer service, materials, parts, skilled labour, markets, finance and administration into a large and diverse metropolitan structure in supportive of high technology industry. Particularly the presence of varied metropolitan markets for manufactured goods not only provides a wider outlet for final products, but also renders the supply of parts and materials for electronic products exceedingly flexible. This flexible supply structure of the metropolitan economy provides an idiosyncratic grounding to a competitive-profit regime of high technology production.

In short, the metropolitan network of micro-electronics production consist of a few innovative technological nuclei, diversified niche skills, abundant labour-force, flexible parts/material supply and wider outlets. A key builder of the network is the large-small firm relations through which a myriad of production and service activities, ranging from conglomerates' R&D to housewives' piecework, are woven into a dense and flexible network for micro-electronics production.⁸⁾ As a whole, Seoul metropolitan region is characterized as a System Area which Leborgne and

Lipietz(1988) define as regionally integrated, diversified, multi-sectoral networks, the locus of multi-regional firms, incubator of new hi-tech firms, technological innovation'.

The flexibility of networks springs chiefly from the metropolitan specific complexity and diversity. The economic logic of the metropolitan complexity and diversity can be understood in the light of the economies of scope which occur "where it is more efficient to operate two activities in tandem than each in isolation" (Dunford, 1989). On the other hand, the economies of scope have some similarity to the cooperation or system economies that integration of labour processes and regulation of material flows can benefit overall production, such as linking R&D closely with manufacturing, and marketing a line of products jointly, or realizing the efficiencies of continuous machine operation by providing a regular supply of inputs.

To conclude, the economies of scope for micro-electronics production come into play only within the complex and flexible networks of metropolitan region. Through these networks, innovative technology diffuses from the upper to the lower tier of technological firms, individual creativity is translated into collective innovation, interaction among actors supplements each other's insufficiencies. Particularly the networking between core large innovative firms and small technical firms is conducive to the realization of innovation via collective effort. Spatially, an integrated network of large-small firm relations fragment a metropolitan area into several discrete industrial districts where a great number of small subcontracting firms are clustered around large lead firms. These metropolitan industrial districts came into being either spontaneously

or through planning.⁹⁾

2) Automobiles and Ulsan Industrial Town as a Neo-Fordist Area

Automobile industry is a leading productive force to set in motion the 80s' industrial restructuring. Korea's modern automobile business arose in the mid-1960s, since which, in pursuit of political favour, several domestic conglomerates have strived to set up the new lucrative business through strategic alliances with multinationals. Contrary to large firms' internal production capability, however, industry-wide supporting basis, such as sophisticated technology, suppliers of requisite parts, skilled manpower, has been poorly established. Despite these adverse conditions, in 1986, the total production capacity of Korea's three major motor-vehicle concerns reached one million cars per annum, yet, one year after, as automobile industry was engulfed into the vortex of sweeping industrial dispute¹⁰⁾, the technical backwardness of automobile industry was of a sudden called into question.

In due course, the reorganization of automobile production has come along in two ways. One is the enhancement of the technical flexibility of internal production processes by introducing a multitude of new machines with artificial intelligence. This internal change ushers in the set up of new specialized technical divisions or firms whose operation in turn requires a new type of skilled labour. The other is the externalization of many production segments into competent small firms with niche-based labour-force and know-how. The process of externalization is institutionally and spatially fostered. Both internal and external changes have reinforced each other through the processes of being

intertwined within a locality context. The most outstanding instance is revealed from Hyundai Automobile Industrial Co. in Ulsan in the southeastern province.

Ulsan is Korea's first and largest industrial town comprising 4 distinct large heavy and chemical industrial complexes, yielding almost 30% of the national manufacturing output. Ulsan's industrial heart consists of 23 gigantic firms affiliated to Korea's largest conglomerate, Hyundai Business Group. Included in the Group are, notably, Hyundai Heavy Industry Co. (also known as Hyundai Shipbuilding Company, the largest scale in the world), Hyundai Automobile Industrial Co., Hyundai Robot Manufacturing Co., all these firms employing almost 70% of the regional manufacturing labour-force. The produce of Hyundai firms in Ulsan ranges from paints, metal pipes, elevators to robots, cars, ships, but are all in some way or another inter-related to a broad category of machine and equipment industry, in which motor-vehicle industry shapes a core.

After the 1987 labour dispute, Hyundai Automobile Industrial Co. has undertaken a number of innovative measures, internally, to cope with increasing labour militancy and, externally, to build an cooperative network for un-disrupted procurement of more sophisticated and quality parts. For the former (i.e. internal one), the mechanization equipped with computer-aided control systems (like numeric control, robots and transfer machines etc.) has been on a large scale introduced, whereas, for the latter, a Just-In-Time (=JIT) network is hierarchically built through the establishment of multiple layers of subcontracting relationships.

It was by the middle of the 1970s

that major assembly lines in Hyundai Automobile Industrial Co. were largely semi-automatic. Since then, automatic convey lines for mass production were introduced and the new system, through several reshaping in the mid-1980s, is fully converted into what Coriat (1991) calls flexible automation system (or flexible Fordist mass production system). Now the operational dynamics of central assembly lines exercise enhanced flexibility, due to their being coupled with other supportive systems such as Parts Deployment System, Priority-Parts Supply System, Computer Aided Design System and Computerized Managerial System. However, contrary to the increased flexibility in the technical arrangement of production, labour processes at shopfloors remain generally Fordistic in the sense that labourers adjust their movements to the speed and flow of conveyer lines, rather than vice-versa which characterizes the classic flexible specialization model. In particular, workers' autonomous involvement in management is either still not allowed or, as a outcome of a Fordist fashion of capital-labour negotiation, partly permitted. What is more, the technical innovation widens the divide between core workers (designers, programmers, technicians, etc.) and periproductive workers (simple machinist, service workers, etc.), as viewed as reflecting a generic trend of flexible specialization towards the increasing fragmentation of technical processes into deskilled and reskilled segments.

On the other hand, the deepening of the division of labour among thousands units and firms constituting a Just-In-Time (=JIT) network is discernible from the fact that the number of subcontracting firms in automobile industry has increased by

approximately 30% from 1985 to 1990: there are now 1,940 subcontracting firms. In the automobile industry where assembling a car requires more than twenty thousands components, subcontracting between large firms as assemblers and small firms as part suppliers is inevitable. For Hyundai Automobile Industrial Co., as in other Korean motor-vehicle manufacturers, subcontracting relations are divided into two broad layers. One is the 1st layer of subcontracting primarily between assembly large firms and so-called Linkage Firms' which have two types: reasonably large firms indirectly affiliated to the Group and small independent firms with a special cooperative association with the Group. The first-layer subcontracting firms are for the most of part specialized in producing technical parts such as engine parts, electric/electronic appliances, brake system, etc. The other is the 2nd layer of subcontracting primarily between first-layer subcontractors and small firms most of which carry out narrowly demarcated but technically not much sophisticated jobs in the production of automobile parts, such as pressing, casting and cutting. Among the above 1,940 subcontracting firms in automobile industry, 540 firms belong to the first layer of subcontracting and 1400 firms to the second. In the first layer, technical mutuality along a functional division of labour is an important determinant of inter-firm relationship and, therefore, the (quasi-)vertical disintegration between large and small firms prevails. In the second layer, increasing wage cost and intractable labour militancy induce large (first-layer subcontracting) firms to cooperate with small firms, yet on the relationships which are characteristically vertical and hierarchic. Of

these two categories of subcontracting, first-layer inter-enterprise relationships tend to weave the networking more absorbent of technical innovation and diffusion.

The recent trend in fact exhibits that the first-layer subcontracting becomes more intensified, with an impact on the clustering of technical firms around the focus of lead firm in Ulsan. This is a phenomenon emerging with the initiation of production innovation in the mid 1980s when standardization and automation of production processes were introduced. Along with the technological innovation in lead firms, subcontracting firms are also encouraged not only to comply with the requirements of new production specification, but also to keep their production in line with the operation of assembly lines. These imposing conditions affect the growing concentration of supplier firms, whose technical contribution become more critical to standardization and JIT, into a location as near as possible to lead firms. In recent days, the concentration is accelerated to the degree that about 70% of core first-layer subcontracting firms operate in Ulsan and its surrounding provinces within two hours' reach from lead firms. Much of interaction between lead firms and subcontracting firms goes through computerized networks, so as to synchronize the cross-flows of all materials and information.

An important point to be noted here is that spatial concentration goes in tandem with technological improvement. In other words, the concentration of technical firms around lead firms is a spatial manifestation of the new technological and productive interaction couched in inter-firm relationships. Hence the locality like Ulsan becomes composed of dense

networks knit with the technical cooperation between lead firms and subcontracting firms. This implies that large-small firm relations in Ulsan's automobile industry constitute the collaborative interaction between technologically specialized work units which gives rise to the collective performance of production. However, for the possibility of technological cooperation is actually dependent upon the sufficient technological competence of individual subcontracting small firm, it is, therefore, not an accident that assisting the technological improvement of subcontracting firms becomes an important part of the productive effort of lead firms. The assistance, encouraged by the new policy for promotion of automobile industry, includes technical and financial help, providing high-priced machine, materials and parts, on-site service and manpower training, all with substantial effects.

On the other hand, what the improved technological calibre of subcontracting firms is supposed to contribute within a cooperative network is the offer of much sophisticated technological niches whose integration eventually leads to the deepening of technological cooperation. Among the most outstanding success of technological cooperation is the invention of what they call Alfa engine' model, which came about as an outcome of a collective technical development project among lead firms and subcontracting firms from 1986 and 1990.

Technological cooperation is also facilitated through varied channels which are not within direct production sphere. A prime example is Hyundai Cooperation Association which Hyundai Motor-vehicle Co. forms with 350 subcontracting firms with strategic

roles in the technological division of production. The Association plays an important role to keep the relationships between lead firms and follower firms routinized and collaborative within a bound of legally defined cooperation. Specification of new products, collective technological development, transfer of technology and machine and the like are supposed to be dealt with by the Association. But it is also important to see that the actual functioning of all these relationships is oiled by the inter-personal contacts susceptible to the force of blood ties, school ties and religious affiliation, all being far from pure price mechanisms at work in markets. These human relations are decisively important in the business related to long-term stable contract, financial/ technical cooperation, key information about new models and settlement of bills. Ulsan is a locality where all these relationships are so densely embedded as to be now nicknamed Korean Toyota.

In short, the network of automobile production serves the functional cooperation of firms with specific technical niches within a geographical system of motor-vehicle production. Flexibility is a lubricant for synchronizing the mass-production processes of lead firms, via (quasi-) vertically disintegrated relationships, with micro technical motions of small firms.

3) Textile and the City of Daegu as a Neo-Taylorist Area

Textile is an industry which dominated Korea's export-led industrial expansion up to the early 1980s. Hence it is generally agreed upon that textile industry was a spring board on which most of large firms could jump to technically more demanding and

organizationally more complex areas of business. With the decline of textile business seemingly irreversible from the early 1980s, large conglomerate firms withdrew their main thrust of business from the textile sector, turning to new high technology projects.¹¹⁾ Ironically, this change has left behind an ample area where new high value added textile business could be undertaken.

This new industrial possibility is most intensely experimented in the city of Daegu in the southeastern province, the third largest city of Korea. Daegu's textile has a long history traced back to the Japanese colonial period (early this century). Nowadays, there are 1,966 textile establishments in the Daegu area, accounting for 65.8% of the national total. What is more, 80.0% of Korea's synthetic textile firms in particular are concentrated in Daegu, the largest concentration of this sort in the world. Most of textile factories locate in the government-built industrial districts where one every two firms is associated with textile business.

Production conditions of textile industry in Daegu, however, are generally backward in character. Not many years ago, the organization of production in textiles used to be really notorious for its highly labour exploitative profiles such as long working hour, low wage, patriarchal control, the dominance of cheap female labour. Even now, still more than 90% of all textile enterprises fall under the category of small scale business employing less than 100 workers and the average rate of obsolescent facilities amounts to 53.0%.

Because of these repressive labour conditions, the workplaces in Daegu's textile industry were deeply wrapped up in the 1987 nation-wide labour

dispute. An immediate consequence was a rapid increase of textile workers' wage. In fact, the wage rose by 74.0% within a year from the occurrence of the 1987 labour dispute, while their labour productivity did by 21.6%. In these days, on top of the burden of high wage, new difficulties deriving from the acute shortage of skilled labour afflict textile firms: the shortage rate is a range of 20-25%. In fear of so-called 'industrial hollowness' in the traditional industry, the government has brought into effect wide-ranging measures to revitalize the competitiveness of declining industries like textiles and shoes. Among the most effective device to this end are the industrial rationalization actions which are stipulated in the Industrial Development Law enacted in 1986. The core of the actions is subsidize the renovation of production process like the installation of new labour-saving high-productivity weaving machines, most of which are equipped with numerous computer control devices.

In terms of the regional allocation of the subsidy, in 1986-1989, 87.4% was let out to the textile firms in Daegu and its surrounding province, North Kyongsang. By virtue of this, in 1992, Daegu's share of automated weaving machines in the national stock has gone up to 65.0%, close to the level of advanced countries like Italy. But more profound changes which accompany the renovation in production facilities have taken place at the level of intra/inter-firm relations.

In response to the mounting labour problems, such as high wage, labour militancy and labour shortage, textile entrepreneurs in Daegu attempt to secure the flexibility of control over shopfloors, by separating their production processes into several units,

some for technical intensity, some for split-up, some for putting-out. Textile production involves usually four distinctive stages: preparation (winding, warping, sizing), dyeing, weaving and packing. The most skill intensive stage is the third, weaving stage, where the flexibility of control improves very much thanks to the above-mentioned high technology machines. Beyond this core technical part, flexibility is secured by the ways in which varied amounts of specific task such as packing and dying are put out to small specialized enterprises nearby, whenever needed. Corresponding to each task, most lead firms maintain open-ended networks for flexible transaction with 2 to 20 specialized firms.

In the case of a firm interviewed, as a result of such change in management, full-time wage workers have reduced from 250 in 1985 to 45 in 1992. Nevertheless, the dominant labour processes at shopfloor are neo-Tayloristic, in the sense that, though the mechanization of main production lines incorporates some degree of new technical flexibility, the actual operation of new production facilities does not require much of knowledge-based labour or sophisticated skill, nor the integration of conception and execution. Yet, it is certain that production processes in general are very flexible. Here flexibility comes in the main from a flexible use of transaction networks built among more than 60 small firms or workshops in the area. The number of the firms involved in the networking changes from time to time, depending on the type of customed products, ordered production quantity, labour availability, prices in markets and so on. Of the total sale, the internally produced share is no more than 30%.

What deserves attention is the new division of labour called 'Little Owner System'. This is a kind of split-up of production lines into several independent units which run on an autonomous managerial basis. The average size of a separate work unit consists of 50 or 60 looms and owners are usually either former technicians with 20-30 year career or former supervisors/or directors of production lines, while employees are those who the technicians or the directors worked together with. A workplace has on average less than 20 employees. Initially, production facilities were rent out from, requisite materials were supplied by, and profit was shared on the basis of a fixed ratio with, parent firms.

Nowadays, the System tends to be more autonomous in terms of ownership. New 'little owners' are encouraged to purchase the facilities under their substantial managerial control. To help this, not only do mother firms offer financial aid, constant supply contracts and even administrative services, but government-supported organizations like Small and Medium-Sized Firm Promotion Corporation also operate various aid programs for technical service and financial guarantee. Under new 'little ownership', it is general that an individual workplace is smaller in size and the core workforce consists of the owner as a former technician and his family. There is a limited number of full-time workers who performs a task in need of specific skill. But most of management is, by and large, run by the full commitment of family labour, at times with a help of flexibly employed part-time assistants. The workplace is usually attached to the residence of the owner. As far as technical matters are

concerned, the owner possesses really versatile craft-based skills. He knows how to set and fix machines, where to buy materials, where to go to find part-time labourers, where to sell their products.

In the new divisional system, the role of mother firms is also specialized, by keeping the technically core part of production process under their direct control, where some degree of factory automation allows for a minimum level of full-time work-force. Relieving from the stress deriving from labour control, these firms are instead more and more concerned with the following matters: improving design quality, getting more production quotas from either other large firms or foreign buyers, or maintaining a coherent transaction network with their associated 'little-owner factories'. Today, faced with the challenges from foreign competitors, notably from China, Korean textile manufacturers come under a strong pressure of having to set their major production target towards the upper niche in world textile markets. All this situation has given rise to the rapid diffusion of so-called 'multiple variety, minimum volume' production system in textile business. One important feature of this system is its dependency on a divisional network where small functional units, each with a special competence, are clustered around the productive foci of mother firms. In Daegu, 86.4% of textile establishments are classified as the type of 'personal workplaces' most of which are 'little owner factories'. These workplaces locate mostly at the outskirts of the city, near to large-scale industrial complexes. The presence of this kind of small workshop firms exercises a good effect in engendering so-called numerical flexibility which derives

from the elastic combination of labour of low technical calibre.

The city of Daegu as a whole is a locality where all elements constituting a system of textile production are tightly knit together. A local wisdom says that as far as textile industry is concerned, one can find and get whatever needed in Daegu. The textile industry of Daegu extends from thread-making, through weaving, to clothing. Supportive industries are also locally thriving. For instance, Daegu's second important industry is metal and machinery, whose historical root is in its role of manufacturing textile machines and tools. Daegu has also the third largest traditional market for textile trade.

This relational network permeates through even the local institutions in supportive of textile industry in general. For instance, in Korea, the city government of Daegu only has an administrative division which deals with the affairs concerning textile industry. So does Daegu's Chamber of Trade and Industry. Daegu is the seat of the headquarter of the government-sponsored Textile Research and Promotion Centre which runs a textile polytec in separation. Down an actual production level, all branches of textile industries in Daegu have their own collaborative associations or cooperatives. To quote but a few, there are Cotton Textile Cooperative, Silk Producers' Association and Synthetic Fibre Business Association. In addition, there are many associations of businessmen or workers which represent functional operation units of textile production, such as Dying Association, Winders' Association, Sizing Association, Packing Association and so on.

To be short, the large-small firm network in textiles works geared to

combining various types of labour at different work-units, via horizontal (quasi-)integrative inter-corporate relations, into a productive matrix for collective efficiency. Flexibility is numerical in character, relative to systemic for the first case and functional for the second.

4. Synthesis: Towards a Tentative Theorisation of Korean Flexible Specialization

1) Flexibility as a Relational Mode

We have shown that, resulting from the industrial restructuring under way since the mid-1980s, Korea's overall industrial system has risen one step up in the technological ladder. In more detail, the restructuring has come along three different levels of technological roads: the blooming of new hi-tech industries along the upper road, the maturing of traditional capital intensive industries along the middle road, the rationalization of traditionally labour intensive industries along the lower road. However, all levels of industrial change commonly internalize new productive practices taking advantage of micro-electronics based technology and, hence, two common patterns of industrial change are found on all three technological levels. One is the internal renovation of production processes as coupled with the use of multi-purpose but flexible machines, while the other is the externalization of production processes as related to the build up of complex but flexible inter-firm cooperation networks. Underlying both patterns of industrial change at depth is the force which stimulates the enhancement of the flexibility inscribed in the functioning of a new production system. Seen in this light, flexibility

is a key organizational and operational imperative of the emerging regime of accumulation (see also, Martinelli and Schoenberger, 1991).

Our essential assertion is such that flexibility does not come from the performance of a single unit of production, but from the ways in which all agents, such as a worker with a specific skill, a production line devoted to a particular goods and a factory plant producing a particular commodity, are brought together into a new complex social division of labour. This suggests that flexibility is cultivated through an associational network woven by the interaction among partakers which, in social economics, largely refer to firms (Sayer and Walker, 1992).

In the capitalist economy of Korea, large-small firm relations are a key actor who weaves a fabric of new flexible production relations. Compared with the conventional flexible specialization model that takes small-small firm networks as a key expounder of flexibility, the Korean model imparts such a role to large-small firm relationships. Differences in firm size denote essentially those in technology, manpower composition, organizational capacity, finance, marketing and even access to political power. These differences allow for not only the hierarchical, vertical, obligatory, dependent type of relations, but also the associational, horizontal, transitive, interdependent type in the large-small firm division of labour. The combination of a series of these differentials reflects a more likely socio-economic world than that of Third Italy. In addition, it depicts a more dynamic articulation between structure and market which gives rise to what Coriat (1991) terms 'dynamic flexibility'. In short, the characteri-

stics of the large-small firm relation model allow us to explain not only the global and structural aspect of system performance, but also the local and individual aspect of agent performance. The explanation of the first seems to be generally inadequate in the small-small firm relation model (see Amin and Robin, 1990).

2) New Role of Small Firms and Specialization

Linkages of large and small firms do not come into being anarchically, but are rather consciously built along an extended circuit of commodity production. In weaving the inter-corporate network of commodity production, large firms form a node, while a multiplicity of small firms build a web on the node.

We have claimed that flexibility is derived from the inter-firm relations, but, more accurately to say, its generative cell lies in the specialized function of an individual firm/agent at work within a system of production. This indicates that, in order for a dense inter-firm network to come into play, among others, the role of small firms has to be strengthened vis-a-vis large firms which endeavor to bring some disintegrative modes into their Fordist production system, but, at the same time, both have to be inter-related to each other's production processes. In Korea, the realisation of all these conditions is effectively encouraged in the institutional milieu in which the government is at pains to bring into effect the structural adjustment of national economy. As regard inter-firm relations, the most exemplary institutional device is 'Industrial Linkage-Making Promotion Act', the gist of which is promote, monitor and sanction the cooperation between lead and follower firms

involved in the inter-linked line of industrial production.

Yet inter-firm relations are also spontaneously fostered beyond such regulatory scheme. That is to say, the social production of new products like hi-tech consumer durables requires large and small firms alike to seek mutual assistance and cooperation in practice. Of interest is that this interchange takes place, for the most part in the fashion that large firms help small weak firms by means of providing high-priced machines and finance, technical assistance, on-site service, requisite materials and parts, market outlets, etc.. Recently this has been intensified in conjunction with the introduction of varied 'Schemes for the Transfer of Large Firm's Business to Small Firms'. The transfer comprises not only hard-ware items like machines/ facilities, but also software items like production patent, organizational know-how and manpower, both accompanied with financial aid and institutional guarantee from either large private firms or quasi-government organizations like Small and Medium Industry Promotion Corporation. In many cases the actual transaction is mediated by the factors concerned with personal relationships, though nominally subject to associations' codes and legal guide-lines.

Large firms' assistance to small firms, however, must be appreciated from the view of its being essentially geared to the need for promoting specialization of the latter. For large firms, the specialization of small firms denotes something supplementing what is either absent or highly costly to retain. On the other hand, for small firms, specialization means something which promises technical improvement, managerial stability, better profit and

so on. Thus, the social process of specialization inherently presupposes a relational division of labour among large and small enterprises.

In essence such relational arrangement is advantageous to both lead firms who lack sufficient capacity, expertise or power to put down wages, and follower firms who lack adequate market outlets, financing and technical skills, or managerial skills. In a specialized division of labour, the interaction between large and small firms facilitates the exchange of ideas, materials and manpower to solve specific problems of design, manufacture and marketing under specific production and labour-service contracts. The catalyst of such outcome is the collective efficiency which the networking of large-small firms based on specialization creates in the course of its operation (Schmitz, 1989).

3) Space, Clustering and a Flexible Regime of Accumulation

The networking leading to specialization tends to be furthered when they are situated in a spatial context. This is most probably because geographical nearness allows for easier knowledge-sharing, shortened exchange of ideas, materials and manpower, benefiting from localized supportive services. When such geographical conditions are bound up with those of productive organization, they work as a stimulus to the furtherance of specialization which would not exist if geographically remote or separated. From this view, we can define the concentration of inter-related activities in a locality as the geographically facilitated form of specialization. That is to say the establishment of inter-firm networking along a productive circuit densely

within a particular local setting. In our study, this refers to the geographical clustering of inter-related small firms around the foci of large firms.

The ways in which large and small firms are clustered differ from one locality to another. An individual cluster comprises an idiosyncratic constellation of inter-firm relations, such as technical cooperation, production linkages, service and financial ties, marketing arrangement, business associations, local infrastructures and local labour markets. It has been shown that in line with three levels of technological change, three regional clusters have been emerging.

On the upper technological echelon, inter-firm relations function geared to the socially engendering of new technological innovativeness in the national industrial system. The relations include the strategic alliance between innovative players affiliated to either domestic conglomerates or foreign firms, the (quasi-)horizontal disintegration between hi-tech large firms and technical small firms, the horizontal disintegration of diverse supportive agents in supply of finance, technology, service, outlets, materials, components, labour. These different layers of relations all shape the system network of high technology production in the metropolitan area. Flexibility comes forth chiefly from the wide scope and diversity of the metropolitan system network.

On the middle technological echelon, large-small firm relations are formed in such a way as to enable to execute technology-intensive mass production flexibly in a technical sense. The relations function on the basis of the (quasi-)vertical disintegration between automated mass-production large firms and subcontracting small firms within

an industrial complex. Flexibility stems, in the main, from the synchronization between the functional divisions of extended (i.e. trans-firm) technological processes like JIT.

On the lower technological echelon, large-small firm relations draw on a divisional device to relieve labour-associated problems of production. The relations take the form of horizontal (quasi-)disintegration between labour-intensive large firms and independent small family-run firms (or workplaces) within an enlarged industrial district. Flexibility springs primarily from the ways in which employment is numerically deployed over extended (i.e. trans-workplace) labour processes.

Tab.2 summarizes the overall pattern of techno-spatial clustering of inter-firm relations.

Putting together, the above three archetypal techno-spatial clusters combine to mould the techno-spatial complex of Korea's new industrial system that takes shape in conjunction with recent industrial restructuring. Each cluster has its own pattern of inter-firm relations and resultant flexibility, so that, while different

kinds of flexibility in the three techno-spatial clusters are fused within the working realm of an industrial system, it engenders a regime-wide flexibility. This makes a crucial point that the political economy of flexibility can be best appositely identified at the definitional level of a flexible regime of accumulation (Gertler, 1988: Harvey, 1989: Martinelli and Schoenberger, 1991: Schoenberger, 1989: Trickle and Peck, 1992), whose detailed characterization, though, goes far beyond this study. Our final remark is that there is no single pathway to a flexible specialization industrial paradigm, unlike the 'new orthodox' which Amin and Robin (1990) have come to labelled Piore and Sabel's paradigmatic theorisation of flexibility drawing upon a singular type of small-small firm relations.

Notes

- 1) The Three-Lows Phenomenon refers to (1) low oil prices, (2) low dollar value, (3) low international rates, all being a by-product derived from the international economic

Table 2. Three Types of Techno-Spatial Clusters

technological level	sectors (example)	dominant labour*	inter-firm relations processes	type of flexibility	locality
upper	micro-electronics	flexible	hi-tech large firms vs. specialized small firms (alliance, quasi-horizontal disintegration)	system flexibility	Seoul (metropolitan area)
middle	motor-vehocles	neo-Fordist	automated mass-production large firms vs. subcontracting small firms (quasi-vertical disintegration)	technical flexibility	Ulsan (industrial complex)
lower	texiles	neo-Taylorist	labour-intensive large firms vs. independent workplaces (horizontal quasi-integration)	numerical flexibility	Daegu (industrial district)

note *: this refers to the dominant labour processes in large lead firms.

order that the American government imposed to solve its own internal trade/fiscal deficits. Lasting between 1985 and 1988, this international situation was so favourable to Korean export as to mark Korea's first record of trade surplus (see Tab.1). The fortuitous gain from trade also saved the 1987 labour dispute from giving an immediate blow to economy. Its full repercussion was only to occur with the end of Three Low Phenomenon, heralding the beginning of a structural recession from 1989.

- 2) These three high technology industries grew by 27.3%, 38.2% and 25.8% per annum between 1986 and 1989 respectively.
- 3) This occurred at the wake of the 1986 civil uprising against the postponement of direct presidential election, eventually resulting in the formation of a new democratic government (1987-92). The new government introduced a host of industrial adjustment policies which served as a great political aid to the venture by private investors, especially large conglomerates, into the burgeoning sector of high technology industries.
- 4) For an indication, in 1990, the total production (as shipment value) of 10 largest conglomerates accounted for more than 80.0% of GNP.
- 5) Between 1980 and 1988, for instance, 10 largest conglomerates closed 12 affiliated firms in textile and clothing, and set up 19 and 24 new firms in metal assembly and machinery equipment respectively, either through internal reshuffles or through joint ventures. As a result of these internal reshuffles, in 1989 the proportion of intra-firm transaction in the total production of 10 largest conglomerates amounted to 35.4% in sale price.
- 6) This account can be applied to the explanation of the concentration of high technology industries in general in the Seoul metropolitan region.
- 7) The number of industrial branches and production items designated by the government for promotion of industrial linkages was respectively 43 and 1,177 (809 in machinery, 221 in electrics/electronics, 118 in shipbuilding) in 1989. On the other

hand, the number of the legally protected associations soared from 6 in 1983 to 1,009 in 1989 (151 in chemical, 231 in transport equipment, 223 in general machine, 330 in electronic/electronics etc.).

- 8) The density of hi-tech linkages in the Seoul Metropolitan region is reported to be slightly lower than that in the San Francisco Bay area, but much higher than in Florida, Scotland, southeast England (Park, S.O., 1991).
- 9) Schumitz (1989) distinguishes between the metropolitan industrial districts of this sort and those of a Third Italian type. But in a country like Korea where the long tradition of small firms or local craft based industries is absent and industrialization has been dominated by a number of large firms based in metropolitan areas, the industrial districts with the characteristics defined in the Third Italian literature tend to be found in metropolitan regions.
- 10) The rate of labour disputes in the sector of transport equipment during the second quarter of 1987 amounted to 23.6%, the highest among all industries.
- 11) see footnote 7).

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