Competition, Regulation and Strategy in Industries with Consumer Side Scale and Scope Economies: An Essay in the Context of the Information Technology Industry[1]

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Abstract

The IT industry (both software and hardware) is characterised by `vast consumer side scale and scope economies' which are incomparably larger than in other industries with supply side network economies like pipelines or electricity distribution. In IT the supply side economies are also incomparably larger because the marginal cost of an additional unit of the software or hardware especially the former is very small. But its uniqueness arises on the demand side. The interaction of these two economies, in a situation of heightened technological dynamism, imposes a greater degree of contingency, and hence path dependency in the developments in the industry as a whole. In this respect these industries are therefore distinguished from nearly all other prior industries. It makes possible giants line Microsoft and CISCO. Even as they extract significant part of the scale economies in the form of large profits, such firms are competitive in the more relevant dynamic sense. The endogeniety of critical points in the development of the industry implies considerable scope for strategy on the part of such large firms. It also means that inter-firm linkages dynamically develop and thrive even in societies like the US that have been abhorrent of extra-market links, and have had the conceptual space to recognise only two kinds of economic coordination - within firms (managerial hierarchies) and through markets. Path dependency implies that physical clusters in IT have a far stronger economic logic, and the difficulties in the emergence of new clusters are far more severe.

Traditional anti-trust like regulation or price regulation is entirely outmoded for the development of these industries. To challengers (countries and clusters) few independent options exist. Strategies with the most potential would involve promoting inter-firm linkages, promoting industries with the least need to be in contact with other firms, in fresh clusters. The effort has to be to lower the time and cost of networking with the dominant cluster. The costs of disassociation are too large even for large countries attempting to have a role in the evolution of IT industries, so that closed-door approaches are almost entirely unworkable.

I
Technological Change, Scale Economies and Regulation

Regulation and competition laws seek to ensure that industries and firms do not make unearned profits (or rents). Conceptually, in a static model of the economy it is easy to differentiate between competitive and non-competitive behaviour and structures. Yet, in practice if the primary objective of a regulation is as stated viz., the minimisation of

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unearned profits or rents, then it is very difficult to rule that a particular situation or behaviour is anti-competitive. This is because over time, given technological dynamism, and changes in income, the parameters that are constant in the simple static model themselves change. Similarly, over time, as new products and substitutes emerge, the assumptions and the very definition of the product or service changes. Therefore, workable competition policy can hardly be defined for the industrial economy as a whole, or be codified at a point in time and presumed to remain valid for many years to come. They, if at all, would need to be industry specific and dynamic. This is easier said than done, since past patterns, and experience, can tell us so little about the future that is driven by technological change[3].

Yet, in certain industries such as airlines, cement, natural monopolies, and others, which tend to large size, the need for some kind of regulation can be argued since market dominance, can (though not necessarily) lead to abuse of power. A closer look at the industries that could gain through a policy or regulation would reveal that many of them besides having a monopolistic character are also not subject to significant technological dynamism. The telecom industry began to show renewed technological dynamism after its maturity in the twenties, with the invention of the transistor and especially the IC in the sixties. Yet the adherence to traditional regulation or oversight of tariffs and rates had most certainly slowed down absorption of cost reducing and feature enhancing innovations and developments in the industry. More than `regulation of a natural monopoly', competition policy in such technologically dynamic industries then has the task of removing or destroying structures inappropriate to discovery, and invention, and especially innovation. It was only after the break up of ATT that the dam holding back the use of new technology broke. Today, given technological dynamism in the telecom industry, and the flux with regard to products and services, it is difficult to see a role for competition policy that can be anticipated and codified in a law[4], to be dealt with by the law without recourse to the study and opinion of experts. Even expert bodies could go completely wrong.

Technology (i.e. rapid technical change) is one factor that vitiates any meaningful attempt to put in place a competition or regulation policy embodied in a piece of legislation that is clear enough. It may also negate the need for `formal competition policy' as such, because inherent in the technological dynamism is the aspect of self-regulation, cost reduction, feature enhancement etc., even when `super-normal profits' are made. Such super-normal profits have not been generally considered as undesirable since they could be considered

[3] This is so well known that, and accepted; yet forgotten in discussions on regulation. Thus, even Thomas Watson (Jr.) projected that the world demand for computers would be in the scores at best, and everybody in the industry was stumped by the success of the PC. Even the motor car or dynamo's successes were not convincingly predicted.

[4] China today when it attempts to force the standardisation of equipment and protocols related to telecommunications, is doing the right thing, because the codification of equipment and parts that it can engender would have far greater competitive effect to result in consumer benefit than anything directly regulatory in the conventional sense in the sector.

as returns to knowledge, and to `intangible' assets and a `necessary return' to encourage technical development[5].

There is another situation wherein traditional competition policy based on antitrust, reduction in concentration ratios, divestment, and reduction in vertical integration, have severe limitations. Examples would be network industries like telecom, road and rail transport, which are well recognised as industries appropriate for imaginative regulation. (In telecom though, the aspect of rapid technological change vitiates the role of traditional price or return based regulation.) Recently, regulation has taken the form of light RPI-X type, sliding scale[6], and even unbundling across activities to allow for a constructed competition whenever possible, and light regulation with better incentive compatibility elsewhere. More importantly, competition in electricity generation, separation of the wires business from the trade in power, have all served to give regulation a fresh aspect. These developments we may group together under the term "rules of behaviour and access, to create competition without destroying scale economies." Thus, access rules and interconnect rules in telecom, standard charges for network access in telecom, power and railways, grid rules in electricity are of this nature.

II
Consumer Side Scale and Scope Economies

This much is well known. What is not recognised well enough is that in certain modern industries, the epitome of which would be the mass-market computer industry, there are significant consumption side economies of scale and scope. These arise on the joint use of software and products that have a vertical and horizontal - suite - relationship to each other. They give industries such as branded software, computer hardware and parts a vastly different aspect. It is quite true that the neo-classical assumption that consumption takes place in isolation, of one's neighbours, or that the rest of society's consumption has little effect on the utility of the individual, is a useful abstraction. But abstraction nevertheless it is. We know that in the so-called life-style associated products, the punk drives utility from the fact that other punks wear leather, and similarly do other subgroups and subcultures of society with regard to their own iconic products. The economic (or marketing) dimension of fashion is the exploitation of this opportunity that is there in the utility of consumption of one person to be dependent upon the numbers of `relevant' others consuming the same product. In life-style associated products as in many other well known products and services, such dependence is based on `ephemeral' psychology and is small enough to be abstracted away by the economist. Despite its neglect by the economist, the marketing man realises the value of such dependent utility. Language, if one may think of it as a product, is, par excellence, a case of vast user side economies. The value of a person's familiarity with a language is a function of the number of relevant others that are familiar with it. Thus, multiple languages (that are also socially functional) typically do not exist in a mass society, and accents converge with the passage of time,

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[5] While the existence of super-normal profits as a reward for innovation can hardly be questioned, the level of such profits could be; and especially so in sectors with vast systematic consumer side economies as the IT sector. We will clarify this point later.

[6] Sliding scale regulation is not really recent. It has been in existence in sectors like municipal lighting, water, and piped gas in the early part of this century. It was rediscovered during the deregulation era of the eighties.

despite very strong emotional and economic value in attachment to a different (own) language by minorities during early childhood. Huge consumer side costs of shifting would mean that languages change only vary slowly. The need for universality in measurements (of length, time, etc.) arising from the high cost of mistakes in conversion from one system to another, would mean that even in a situation of weak across subgroup interaction, competing standards would not survive[7].

Consumer Economies in Computer IT Industry

In computer usage, the value to an individual using a particular brand or type of world processor is considerably enhanced when others with whom he interacts uses the same product. Thus, even if he had large cost of shifting out from brand Z, when most others use brand Y, he would have to shift out, despite the possibility that brand Y is superior and brand X is less appropriate to his specific needs. Conversion programs are possible, but are `never' the same. Similarly, the value arising out of avoidance of risk and incompatibility in the use of the brand over product categories together when they have a vertical relationship between them –(as for instance between operating system and application software, or machine and operating system) is very large. Additionally, the consumer side economies also arise out of considerable lowering of the learning costs for new users and users moving along the main evolutionary path[8], which itself is a result of the consumer side economies mentioned earlier. This implies that in such industries there is `path dependence' and changes have to go over feasible transition paths, quite like in biological evolution. Feasibility herein, as also in the evolution of morphological features in nature, is such that a large leap has to have a feasible path consisting of a number of small jumps, since otherwise, the costs of relearning, and loss of connectedness with the rest of the world by those adopting the new development, when not gradual, are too large. What is true of software is also true of machines, components, cards, subsystem, etc[9].

Interaction with the Supply Side

The matter does not end in only recognising these joint economies in consumption. These consumption side economies in turn could drive producing firms, and collections of firms to strategically posture to take advantage of these expected consumption side economies. This they could do through very low prices for initial users (or high prices when there is no question of challenge at all) and near certainty of adoption, free compatibility with

[7] Thus only the `metric' and British systems survive today, and without the insistence of the Americans, the British system should have been given up long ago.

[8] Many levels of courses and learning programmes and virtual explosion of books and materials related to learning, are all possible because of the large market for skill up gradation, to enable people to be a part of the community of computers users.

[9] It also means that a basic form such as a stiff backbone or warm blood, once it emerges, is embedded in the morphology of all living beings that evolve from the mutant, to serve various functions, to result in classes that have an evolutionary meaning. Similarly, in the IT world, core developments like say a Von Neumann architecture, for all digital, or sort routines that are embedded in software, or methods of addressing memory, program components, are the building blocks that live on through the vintages of machines and programs as they as they evolve. The analogy continues at the level of the relationship between the product and the environment, with the species and the ecological environment. The environment in both cases is defined by other products or other species, and their functions.

existing products by the challenger, and so on. In software, as also in certain hardware, like microprocessors of mass use, the marginal costs are very low as to be negligible in relation to fixed (or initial development costs). Therefore, the market has few stable points, and they all tend towards one producer, one brand or a line of product. The second player would always be a niche player, and would have to wait his turn with a vastly better product and a feasible transition path as the market greatly expands, or to cater to a new market as the existing one segments or splits.

Thus, the positive feedback from consumer side economies to the producer side economies in software, in mass markets, has created a giant like Microsoft. A 'market of sorts' in technology would mean that even if the internal capacity of the dominant player to generate fresh technology and innovate is, over time, reduced[10], it can always buy up inventions, and success factors, including such lines of products and ideas for new and emerging segments of the markets. The "take over" of successful small firms is inevitable owing to the vast asymmetry in the benefits to both consumers and producers between being on the path of convergence and compatibility of the new technology/idea, in relation to a divergent or different path. Indeed, so large is the difference in the value to the creator of the new technology that the object of challenger is to be taken over. In other words, the growth phase of a new product or technology arises out of a `solution' in full cooperation with the dominant firm, or in other words acceptance of the existing paradigm. This is how we can understand the need for `feasible' paths out from the present technology.

"Forever" Immature?

We have not yet brought in physical connectedness that the Internet demands and brings about. This aspect further deepens the potential consumer side economies that would drive the industry towards centralisation ultimately, even if when today the technology creation process is apparently more plural. This is because the Internet industry or the industry for physical connectedness is still at an early stage, and many new ideas, technologies; ways of applying those technologies are still awaited. The creative acts required for these developments can hardly be imagined before they occur, nor can they be planned for. They would necessarily have to go through the process of serendipity, chance and the `activities of mavericks.' This means that even as centralisation is the final point, the fact of continuing fresh developments would keep alive, and create many small firms. The characterisation of this phase of the industry as Phase I of Stephen Magee[11] is illuminating. Nevertheless, the difference from Magee's conceptualisation is crucial. The phase of `basic' and innovative development continues even into Phase II when

[10] In evolutionary changes, the large corporations would have all the ideas; but for those remarkable and truly novel (revolutionary) ideas, there are managerial limits to motivating employees to invent and innovate within a company. Even stock options and developments in differentiation and integration (a la Lawrence & Lorsch) cannot really bridge the gap between the `maverick' inventor working on his own and the corporate inventor (Lawrence, P.R. and Lorsch, J.W., (1967), "*Organisation and Environment*," Boston Harvard Business School Press).

[11] Magee Stephen (1977), "Multinational Corporations, The Industry Technology Cycle and Development," *Journal of World Trade Law*, pp 297-321, which is a development of the product cycle approach of Vernon, Raymond (1964), "The Product Life Cycle in International Trade", *The Quarterly Journal of Economics*.

centralisation via takeovers etc. is evident. Thus the industry has a `forever' -immature character, with high rates of growth and obsolescence as long there is a continuous stream of innovations and final demand exists.

III
The Regulatory Challenge

Traditional regulation and competition policies have little role in the evolution and development of such industries. Economists neglect the vast consumer side economies, and their interactions with the more understood scale and scope factors on the production side, which drive firms to large size and dominance. Similarly, traditional anti-trust laws still hold on to the idea of an absolute value of a product to the consumer and of consumer independence. These would mean an inability to recognise the functionality of a growing large firm giving great value to consumers. Traditional regulation or policy would also not be alert to the ways by which large dominant firms abuse their special position. The dominant firm in keeping itself in dominance could act to keep the industry at lower rates of innovations, lower levels of services and features. This need not take place in a manner that is obvious or recognisable. Such a dominant firm could lay to the side possible superior ideas and innovations, which would therefore die, especially since their value is contingent upon the particular path chosen, and dominance can greatly influence that choice.

Yet, the evolutionary aspect, arising out of both learning costs on the part of users and consumers in general, and out of the finite time required for the fullest development of a technology or idea, select some innovations/ideas and reject others. And technical superiority is only one aspect in that process. Can any regulator convincingly decide that one (the sunk costs of learning for instance) or the other (abuse) consideration operated at a critical juncture in the development of the industry? Quite obviously no! But then what can the solution be, if at all there is a need for a solution? There is little that can be said with confidence. The problem is one of fundamental uncertainty; and `humps' in the evolution of such industries greatly reduce the value of prior expertise or experience as a guide. Furthermore, there is a basic difference between the IT sector and earlier industries that amounts to making IT industries fundamentally different from all others.

The key `humps' or forks in the actual road that the industry takes is, to a far greater extent than in other industries before, determined endogenously with the dominant players having a large, even overwhelming role. The growth of the IT industry has some elements of the unfoldment of the story out of the characters created, than that being entirely the natural revelation of the possibilities arising out of a revolutionary technical understanding as was the case in the electrical or chemical industries.

Ex-post therefore, to the keen observer of the industry, it would then seem as if the industry could have more quickly moved to its present status in terms of product range, and size without some of the detours and dead ends into which some firms and segments of the market went into. And they would be quite right in a purely (ex-post) diagnostic sense. But that diagnostic and understanding does not translate into any ability to foresee even the next "hump" and decide that this one path ahead rather than the other would be the more correct one. Indeed the approach itself is akin to raising the issue of the

relevance or need for say the reptiles and birds or non-primate mammals to have emerged and diversified in the evolution of man. We must remember that the number of dead ends and niches that have been realised is only a subset of what was possible, and the set of all possibilities is not known, certainly not at the beginning of the process. And may even be never known. Thus, chance, and individuals and firms, have a role in the evolution of the industry that is vastly more significant than in the case of the more usual industries such as automobiles, oil, chemicals, etc. In these latter industries one could, without being too far from the reality, have taken the position that the key innovations were demand driven and supply constrained (that is belong to a small set) and would in any case have occurred, once the key discoveries were made.

For these reasons, regulation or competitive policy as in the traditional sense has little meaning in IT industries. Nevertheless, certain insights may lead to the contours of a fresh approach to aiding and abetting the faster development of the industry.

IV
The Intra-firm Aspect

The traditional approach has the difficulty in that it recognises only two forms of economic organisation - the market, and the firm or the managerial `hierarchy' when firms are large and internalise diverse activities and products. In reality there have always been some links between firms; even among those that compete vigorously in the market. Western culture, which ascribes an absolute meaning to the individual, has intellectually found it convenient (and no doubt useful) to therefore make a sharp divide between the firm (conscious coordination) and the market (unconscious, unregulated coordination, or auto-regulated)[12]. But this is only an abstraction of the neo-classicals, as pointed out very early by Herbert Simon[13]. Even in very simple products like automobiles and components, groups of firms require extra-market relationships among them in the form of exchange of designs, placement of inspectors at the supplier's shop floor by the purchaser, and longer term contracts, etc., for realising a greater part of the economies. Societies with lesser (conceptual) need for the dialectic between the market and the firm exhibit a larger role for coordination through networks. They also do not see as much value in the conceptualisation (or abstraction) of a sharp divide between markets and hierarchies. In certain industries (automobiles or electronic goods) in Japan, the network of the Kieretsus is the organisation.

So large is the need for firms in the new industries for this network-based coordination that even in the US with a culture that in chary of extra market relationships, there has now developed a complex web of relationships that is at once evolving and getting internalised within firms with takeovers and mergers. The content of these relationships involve evolution and agreement of standards, sharing of information about a product - before its release (since its value is contingent on others being able to develop `final'

[12] The neo-classical economists who believe they understand markets, have therefore, "explained firms" as arising out of the existence of transactions costs. While explaining firms in terms of markets is one task, another task would be to explain extra-market links between firms in the language used to understand markets. This is just beginning with the literature on interfirm linkages in the context of small firms.

[13] Simon, Herbert, A. (1977), "*Empirically Based Microeconomics*," Cambridge University Press.

products based upon it), agreement to develop particular products, timing of release of new products, sharing of information on possible developments even if the contours are not as yet clear, contracts to develop particular products whose need is recognised, cross licensing to cover the risks of innovation and standards.

When the coordination required across firm boundaries is more definitive than what the above links can provide, and when upon the coordination rests much of the estimated future cash flows, then mergers and takeovers happen. A merger or a takeover price of a small technology based dynamic firm is certainly a measure, however crude, of the value it has created. But that does not mean that the creativity of the `competing' small firm whose product/innovation did not fit, has been nil. The competing firm disbands and its value as a firm is destroyed, though the creativity of its people could be exploited in other firms. In many cases this is appropriate. But in many others, if that happens it would be a social loss. The possibility that the "next time round, this time's `loser' could turn the winner" is thereby rendered non-existent. This means that the market for extra firm coordination arrangements is being limited by the lack of adequate and overarching arrangements and frameworks for inter-firm coordination. The traditional notion of competition, which would look suspiciously at such arrangements, would no doubt stand in the way of evolution of industry practices that make for a greater room for such practices[14].

Thus, (1) frameworks covering cost sharing in the contingent development of technology; (2) oversight by third parties or parties representing users (another segment of industry) in the definition of standards; (3) rules to bring about greater transparency and non discrimination in disclosure and documentation of features and systems - especially at the boundary between activities/products that have a vertical relationship with one another, all would considerably enhance the scope for inter firm coordination arrangements. These arrangements when both dynamic and stable at the same time reduce considerably the need for takeovers. Inter firm arrangements, when between non-equal parties has the tendency of being `unfair' to the smaller party[15], especially because the possible stupendous returns to its creativity tend to get appropriated by the more dominant firm. This tendency, to some extent, can be corrected by arrangements that share costs, benefits and risks, which smaller firms may be able to take advantage of. In other words, quicker consolidation of innovations within a managerial hierarchy through takeovers is a result of "market failure". The legal and conceptual developments to understand and define the inter firm boundaries have only just begun. We know that more innovative definitions of property and associated rights have for example helped to internalise externalities when transaction costs are low, as in the case of pollution. In a similar manner, a residual royalty related to future sales (when attribution in part of the technology to a

[14] The anti trust laws in the US have now recognised that the agreements between firms for technology development are not anti-competitive. But there is obviously a need to go beyond agreements for technology to agreements for sharing of production and marketing costs, for funds to cover standards propositioning and technology selection risk.

[15] A most significant exception has been the case of the arrangement between Microsoft and IBM that led to the PC revolution, with Microsoft contracting to develop DOS. But that Microsoft would be able to build an empire on the basis of its freedom to independently license DOS, could not have been anticipated, because nobody (not even Microsoft of IBM) anticipated the PC market to grow as much as it has.

product/service is possible) would lead to some share in the vast benefits out of a certain technology or product of the smaller `bought over' firm or its original owners.

V
The Importance of Market Size

Despite massive state support, neither Japan nor Europe have been able to make inroads into US', and more specifically into Silicon Valley's dominance in the creative sub sector of the IT industry, especially in that segment of the market that interfaces with the customer. It is only in entirely new business areas that have somehow "stood alone", and were neglected by the US that outsiders have had a chance. Thus in sectors where hardware manufacturing specifications define the performance (density of ICs on a chip), like D-RAM chips, or in video game chips which were ignored by the American market, that the Japanese have been able to make inroads. This is because the vast consumer side economies, and the supply side economies which are linked together would make the potential value of an innovation in a market, a power law relationship to its market size, with the power being very much greater than 1. The requirement of coordination across firms shifts the advantage to the larger cluster. Thus despite various home origins the `centre' of most IT companies becomes the US. Firms have a strong need to lower the cost of inter firm communication, and knowledge of the `whole' is vital for success in their own efforts (individual) micro efforts, since the value of what is created is a function of where in the evolutionary chain, the product or process finds use. It is this contingency that drives every firm towards the same cluster.

It is only with some maturity, that is, when rate of output of new ideas/products etc. slows down, that other locations, including Europe would have a chance[16]. This ties up with the fact that success of the industry elsewhere than in the dominant locale is necessarily based on a focus on separable branches, or on activities, which needed to interface less with other activities. Or when the need for interaction was significant, it was on terms that were are definable ex-ante. Alternatively, the thread of development of the industry elsewhere, has to be so fundamentally new as to be not seen as being related to the developments in the dominant cluster. In other words, only peripheral paths, and `dead ends' or fundamentally new technologies can be successfully worked by non-dominant locations as long as the centre shows dynamism.

Economics of Connectedness

One element of its dynamism and generating capacity is its openness to fundamentally new developments elsewhere. What are options for the non-dominant locations? Clearly so large are the economies of being connected to the centre, as also the need to coordinate with developments at the dominant location that no closed development (with an initial import of technology as in other industries) is really possible. This is because the closed development in the alternative location would have to deny itself the benefit (very large) of innovation at the centre and elsewhere to which the centre is linked, while betting on

[16] The idea here is similar to that of the product cycle (*Vernon, Raymond (1964)*, op.cit.). Therein the need to be near the customer drives. Here that need is vastly more acute, and the customer is typically the firm. The contingency of change, rather than an exogenous determination of the products and processes implies that being in the primary cluster is vital to survival itself.

the low probability event that in isolation from the closed centre it would hit upon a fundamentally new idea that would be vastly superior to all developments at the centre. Indeed, closeness may well be `necessary' or desirable for a really new idea to take root. So while no doubt the probability of a fundamentally new innovation increases in relation to the resources spent in the distant centre, the dominant centre would always have access to the new ideas of the `closed centre', since the `closed centre' can really be closed only in one direction. Thus, to the `closed centres" approach there is a `free-rider' problem. In any case, unless the closed centre is substantially large, nothing significant could come. But when substantially large, the immediate losses in being closed to the dominant centre would also be stupendous.

Thus, the strategy for the industry elsewhere than in the dominant centre, and especially so in locales with small markets today, but with a potentially large market tomorrow, would be to be as open as possible to the dominant centre. In any case, the risks of closed strategy are stupendously large and quite unbearable to all but the largest economies[17]. Thus policies that directly and indirectly enhance and cheapen the linkage and coordination with firms in the dominant centre would be right strategy.

It is in this context that measures that allow a greater space for inter firm coordination even across national boundaries, become relevant, and vital. A significant aspect of the cross border inter firm linkage, is the movement of people, especially from the smaller `centre' to the dominant centre, and back again. Thus, a vastly greater mobility of persons, than in most other industries would be required for competition from other potential centres and of a fair playing field to unleash the long-term potential of `competing centres.' The need for labour and skills mobility is of a vastly higher order than in the services industries in general[18]. In feedback industries, the very industry cannot arise without the necessary inter firm linkages. Thus, the strategy for countries/ regions competing for ‘centres’ would be to negotiate skilled labour access to the firms and markets of the dominant centre as a competitive strategy. This, while it broad-bases and increases the dominance of the centre and makes for its faster and more open growth, also creates large subsidiary clusters which have the long term potential to either be hived off, or develop into `special' clusters.

Conclusion

The IT industry both software and hardware is characterised by `vast consumer side scale and scope economies' which are incomparably larger than the supply side network

[17] There is an additional aspect that needs to be recognised. The fast pace of development of the industry means that the discount rates internal to the industry are larger than for the general economy. Therefore, such efforts to develop fundamentally new technologies that are in opposition to the line of unfoldment in the dominant centre or cluster, would not find takers in the market. Hence, the possibility of state involvement opens up. State involvement has its own problems of state failure; few states can at this juncture finance and organise competing closed centres in the IT industry.

[18] In traditional service industry like say street cleaning service, if poor country people are not allowed to work in the rich countries, then factor price equalisation is affected, but the service industry in the poor countries could conceivably grow, as the home market itself grows or other tradable sectors grow.

economies in industries like pipelines or electricity distribution. In IT the supply side economies are also incomparably larger because the marginal cost of an additional unit of the software of the software or hardware especially the former is very small. But their uniqueness arises on the demand side. The interaction of these two economies, in a situation of heightened technological dynamism, imposes a greater degree of contingency, and hence path dependency in the developments in the industry as a whole. In this respect these industries are therefore distinguished from nearly all other prior industries. It makes possible giants line Microsoft, which even as they extract significant part of the scale economies in the form of large profits, also keep them competitive in the more relevant dynamic sense. The endogeniety of the critical points in the development of the industry implies considerable scope for strategy on the part of the large firm. It also means that interfirm links dynamically develop and thrive even in societies like the US that have been abhorrent of extra-market links, and have recognised only two kinds of economic coordination - in firms (managerial hierarchies) and through markets. Thus physical clusters in IT have a far stronger economic logic, and the difficulties in the emergence of new clusters are far more severe.

Traditional anti-trust like regulation or price regulation are entirely outmoded for the development of these industries. To challengers (countries and clusters) few independent options exist. Strategies with the most potential would involve promoting inter-firm linkages, promoting industries with the least need to be in contact with other firms, in fresh clusters. The effort has to be to lower the time and cost of networking with the dominant cluster. The costs of disassociation are too large even for large countries attempting to have a role in the evolution of IT industries.

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