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POLICY PROCESSES AND THEIR IMPACT ON
INDUSTRIAL AND TECHNOLOGICAL DEVELOPMENT -
A CASE STUDY OF KELTRON

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Policy processes and their impact on industrial and technological development - a case study of KELTRON*

In recent years government economic policies in India have moved towards increased liberalisation. Conceptually this means allowing greater play of market forces; in practice it means reduced government control over the pattern of production and consumption, an increased role for private firms and greater import of products, technology, and capital. This is not to say that the system of government controls has been dismantled: controls continue, attenuated or unattenuated, in several areas. In addition, over the last decade the role of public financial institutions has increased enormously. These institutions often have independent policy objectives and criteria for evaluating projects. Between controls in some areas, liberalisations in others and the requirements of financial institutions, firms in both the public and private sectors have to strike a delicate balance. The result often is accommodation of short term priorities and neglect of longer term considerations, such as technology development, production pattern and income distribution.

* KELTRON is the short form for Kerala State Electronics Development Corporation. I am grateful to Prof. K N Raj for suggesting this note. I am grateful also to KELTRON executives for several discussions and access to relevant information. Unless otherwise stated all information in this paper has been supplied by KELTRON. The Centre for Development Studies, Trivandrum where the author works, and KELTRON are sister institutions coming under the purview of the Department of Science and Technology, Government of Kerala. The inferences drawn are those of the author and should not be attributed either to KELTRON or to CDS.

In this paper we discuss the experience of an electronics firm to demonstrate the effects of government policies on long-term corporate growth and indigenous technological development. The firm studied is Kerala State Electronics Development Corporation (KSEDC) - a Government of Kerala undertaking - which markets its products under the brand name KELTRON and is popularly known as KELTRON. An electronics firm was chosen in view of the expected revolutionary role of electronics in production technology and on consumption patterns. A public sector firm was chosen in order to understand how current policy processes impinge on long term social and economic objectives (equitable income and wealth distribution, infrastructure and technology development) sought to be attained through direct public investment. The focus on a public enterprise also provides insights into managerial objectives and behaviour within such enterprises (see Stewart, 1982).

We first discuss KELTRON's control systems project which throws light on the effects of policies followed by the Industrial Development Bank of India (IDBI) and the Monopolies and Restrictive Trade Practices Commission (MRTPC). We then discuss KELTRON's application for an industrial licence for the production of video cassette recorders (VCRS) and colour TV monitors. The bulk of the paper is devoted to control systems which have the potential of significantly increasing the efficiency of continuous production processes. VCRs are similar to control systems in one respect: they embody frontier technologies with intense competition between

leading international firms and hence the possibility of further technological development and/or product differentiation. However unlike control systems, VCRs are principally durable consumer goods associated with high international standards of living.

I. Control Systems

Systems for industrial process control continuously monitor a large number of variables, assimilate and interpret the data and on that basis make the required adjustments in the production process. They, therefore, help in increasing productivity and in protecting human life.

The market

The production of electronic control systems is still in its infancy in India. It is expected that the market for control systems will grow rapidly in the coming years. Thermal power stations, steel, cement, chemical, paper and textile mills are expected to increasingly install electronic control systems. Several firms, in both the public and private sectors, have, therefore, sought to enter this area. The Secretariat of Industrial Approvals (Ministry of Industry), on the advice of the Department of Electronics, has issued several licences, to both public and private sector firms, for the production of control systems. The bulk of these licences appear to have been issued in the late

1970s and early 1980s. There are four principal indigenous firms: KELTRON and Instrumentation Ltd., Kota in the public sector and Taylor Instruments (of the Birla group) and Bells Controls (of the Jalan group). It is possible, however, that more firms may become serious competitors. Two multinationals have sought to enter this field. Siemens India Ltd. applied for a licence recently. The matter has been referred to the MRTP Commission. PIECO Electronics and Electricals Ltd, whose parent company is Phillips, Holland, has been given a letter of intent, which is the first step towards the issuing of a licence.* The MRTPC has recommended that PIECO be given a licence. Three public sector companies, KELTRON, Instrumentation Ltd., Kota, and ECIL appealed to the MRTPC to disallow the entry of PIECO into the area of control systems. The appeal was rejected.

KELTRON was one of the early entrants into the field. It was given a letter of intent in December 1977 and an Industrial Licence in May 1979, making it the third company to be licenced to manufacture control systems. It has since, along with other companies, sought and been allowed enhancement of capacity.

* The Department of Electronics (DOE) is the relevant authority (and has issued several licences/approvals in the small scale and organised sector) for 'Microprocessor based systems' which have relatively simple business or research applications. However, the technological more complex 'Process control instrumentation system' is regulated by the Ministry of Industry. PIECO has registered its case as 'Microprocessor based control instrumentation system', a convenient hybrid which has enabled it come under the DOE rather than the Ministry of Industry; this indicates an attempt to enter a technologically sophisticated field from the backdoor. It is not clear why the DOE permitted this.

The technologies

The KELTRON project is being implemented in technical collaboration with Controle Bailey of France. The technology acquired enables KELTRON to manufacture analog control systems. When the technology was purchased, analog techniques were very widely used, but they were clearly on their way out. Since then digital techniques have quite overwhelmed analog techniques for several reasons. In the analog system there is a central control room where all the process variables (temperature, pressure, flow rate etc.) are monitored and controlled. Digital technology permits distributed control, i.e. local controllers of individual machines or subsystems are situated, so to say, in the field.

"The local controllers are connected via a data highway to the central operations centre. The only information that must be sent from the controller to the centralised operations room is 'exceptional data'. That is data of exceptions to the accepted norms. The mundane, day-to-day control is concentrated in the localised controller. ... the centralised computer has been freed from the responsibility to monitor all inputs and outputs. It can now be configured to perform such plant-wide supervisory tasks as energy management and optimisation ..."(Hindu, 1983, p.17).

The digital system in relation to the analog system is more reliable and flexible and is less energy intensive and has therefore lower operational costs. Since it requires considerably less wiring, it also has lower capital costs. The cost differentials between the two systems are likely to increase

over time since the digital system has a higher ratio of electronics to non-electronics components and economics may be mainly expected in electronics components. An appreciation of these differences in technologies is necessary in order to understand the current conflict between electronics firms, which we discuss below.

The use of industrial control systems is expected to grow significantly in the industrially advanced nations (Ernst, 1981, p.55); as such, it is likely that there will be continuous technological improvement in both the hardware and the software.

Indigenisation

Immediately after the KELTRON project was conceived the country's power generation programme was given a higher priority, resulting in the various State Electricity Boards floating international tenders for import of control instrumentation system packages in fully assembled form. Realising this opportunity, Keltron, as a proposed manufacturer of such systems, offered the Control Bailey systems against similar tenders and won a few tenders. As such, the first stage entailed import of all vital systems and equipments in assembled condition from Control Bailey and other foreign suppliers. KELTRON's job lay in procuring certain supportive indigenous components, installing the units and more importantly in providing the system engineering. This phase of the project began in 1979-80. Some of the projects taken up on this basis are nearing completion. These include the

Wanakbari Thermal Power Station under Gujarat State Electricity Board, the Tuticorin Thermal Power Station under Tamil Nadu Electricity Board and a captive power plant for IOCL, Baroda.

At the second stage, semi-knocked down equipment and components were imported and assembled by KELTRON.

Since then KELTRON has invested substantial resources in the indigenisation and upgradation of Control Bailey technology. There has also been an attempt to lay bare the know-why of the technology. All support systems, all mechanical and plastic components and some electronic components have been indigenised. The heart of the control system, the surveillance monitor, has been upgraded and a range of complementary technologies have been developed. Many of these represent 'firsts' in India.

However, ~~although~~ 80 per cent indigenisation has been achieved with respect to the number of components, only 60 per cent of the value of production has been indigenised, i.e. 40 per cent of the value of output is imported.

Moreover, this entire development has been within the framework of analog technology. Indigenous development of digital technology should be feasible, but it would require: a) a long lead time and b) pooling of resources by leading electronics firms (and research institutes) since KELTRON's resources are likely to be sub-critical for the purpose.

KELTRON's experience with the controls project throws light on the impact of policy processes on industrial and technological development. In one case, KELTRON applied to IDBI for term finance for its controls project. In the other case, KELTRON along with two other public sector concerns appealed to the MRTPC to disallow the entry of a multinational into the control systems field.

(1) IDBI

In November 1980, KELTRON applied to the IDBI for a term loan of Rs.5.5 crores for its controls project. At that stage KELTRON had already raised (as equity capital) and invested about Rs.3 crores. The equity capital was almost entirely subscribed to by the Government of Kerala. KELTRON has now been negotiating with the IDBI for over two and a half years. The term loan from IDBI was, and continues to be, of importance not only for financing capital expenditure but also because the release of working capital finance by State Bank of India is linked to the sanctioning of term finance. However, the loan has not been forthcoming despite tortuous negotiations between November, 1980 and June, 1982.

IDBI initially suggested that a new and independent company be set up for the production of control systems. It was apparently also suggested in private discussion between the heads of the two institutions that the new company be in the private sector. This, ofcourse, hardly made sense to KELTRON which had already sunk considerable time and money to get the project going. Moreover,

in KELTRON's judgement, this project was of strategic importance to its future financial viability.

The line taken by IDBI has subsequently been that KELTRON should first set its house in order by stabilising its other ongoing projects before going further into the control project. On this note IDBI has virtually closed negotiations for the present.

KELTRON has pursued its case at two levels. One, KELTRON has claimed that as a "development" agency it needs to continuously diversify into new product lines. In this argument considerations of financial profitability do not enter (explicitly at least), but rather there is an implicit suggestion that the diversification serves some larger national or regional purpose, the benefits of which may or may not appear in the profit and loss account of the company. The larger purpose in this case could possibly be served through the location of the project in an industrially backward district.* The logic of government incentives for the development of backward areas has been that it helps the utilisation of surplus local manpower resources and also leads to the exploitation of local materials. The larger purpose cannot in this case be the generation of employment. It is not necessary to diversify for increasing employment - the purpose can equally be served by expanding in existing lines. Moreover, the control project is extremely capital intensive; it is unlikely that the

* The project is situated at Aroor in Alleppey district.

project will generate much employment either directly or indirectly (through ancillarisation or other backward linkages) in the next six to eight years at least. Since about 40 per cent of the value of the final product is accounted for by systems engineering, the project is obviously human capital intensive; but this only means employment of some highly skilled engineers, with considerably less scope for significant semi-skilled employment usually associated with electronics industry in developing countries. Also, in view of the high (40 per cent) import content (despite indigenisation), the use of local materials is not likely to be of significance. Thus, one may presume that the main "developmental" potential of the project is technology development.

But it does not appear that the IDBI has been particularly concerned with these issues. IDBI's focus has been on the financial viability of KELTRON's overall operations and hence the wisdom of an additional venture. KELTRON has been stressing that its past troubles have at least partly been due to irrational and wayward indirect taxation and that its projects are likely to turn the corner soon. On the control's project, KELTRON's claim to financial soundness has been based on two considerations:

1. KELTRON has argued that the market for control systems (particularly in power plants) is vast and that it has few competitors (in the power plants field the only serious competitor is Instrumentations Ltd.).

2. KELTRON had also stressed the fact that its collaboration with Controle Bailey for France and the import initially of all vital systems in a completely assembled form made its product extremely competitive. In pointing to its competitiveness based on foreign collaboration and high import content of its output, KELTRON underplayed any phased indigenisation of product design and development and use of local materials, components and equipments. This apparently is a plus point in its dealings with IDBI. Collaboration and large imports make for better financial viability.

(2) MRTPC

In August 1982, three public sector concerns, KELTRON, ECIL and Instrumentations Ltd., appealed to the MRTPC that PIECO Electronics and Electricals Ltd. be disallowed entry into the microprocessor based control systems area. The appeal was based on the following considerations:

(1) The Government had issued several licences to both public and private sector firms for the production of electronic control systems and hence the market was already highly competitive. (2) The dilution of foreign equity holding down to 40 per cent had had little significance in management and organisational terms. PIECO like its predecessor, Phillips (India), continued to have access to vast financial, marketing, manpower and technological resources based on its multinational connections.

As such, its cost structure "does not seem to be based on Indian conditions and experience". This along with the fact that PIECO would continue to use the Phillips brand name made it extremely likely that PIECO would outcompete the existing firms in the market. On the other hand, the appealing public sector concerns claimed that they had invested significant resources in the development of the microprocessor based system which would prove infructuous if PIECO was allowed to enter the market. They claimed that the non-entry of PIECO and hence the protection of public investment was in the "public interest". (3) The appealing public sector firms also were of the view that Phillips over the last thirty years had manufactured only low technology items (such as lamps, lamp fittings and radios) in India. As such Phillips had done little to add to the stock of technological knowledge in this country. In addition, Phillips had repatriated considerable sums reducing the investible resources within the country and drawing down scarce foreign exchange. On all these counts the public sector firms claimed superiority. They stressed in particular the national objective of self reliance. KELTRON's stand in this regard has been that it has the potential of contributing significantly towards the building of a self reliant electronics industry in Kerala and in the country as a whole.

The MRTPC certainly appears to have gone out of its way in recommending that PIECO Electronics and Electricals Ltd. be granted an industrial licence for the production of microprocessor

based automatic industrial process control systems. The MRTPC's judgement in allowing PIECO entry into the control systems area seems to have been weighed by the following considerations:

1) "This (control systems) is an area by its very nature in which small firms have limited scope to operate. Only large firms with a highly competent multidisciplinary technical team combined with a widespread marketing and servicing network can compete and successfully deliver the automatic process control systems to industrial plants" (MRTPC, p.52). Also, "... the existing firms in this service industry devote most of their time and resources to providing the systems with commercial applications. The application of mini-computer/micro-processor based systems to automatic industrial process control is far more complex than the application of such systems for commercial purposes" (MRTPC, p.51). In the Commission's view there is a large potential demand for control systems which has not been converted into effective demand at least partly because of "cultural barriers" (MRTPC, p.46). The Commission felt that PIECO with its large resources and expertise would be able to convert potential demand into effective demand. 2) That the very same advantages would give monopoly power to PIECO is an idea that did occur to the Commission, but it was quickly discounted. The Commission felt that conversion of potential demand into effective demand would create enough space for everyone. The consequences of an initial lead in the market and the use of "Phillips" brand name do not appear to have been discussed. Instead, the

Commission seems to have made the rather facetious point that control systems is so competitive an area that even large companies such as IBM have not been able to acquire monopoly power in the western economies. Even if that statement were to be accepted, any inferences drawn from that for the infinitesimal Indian market are surely illegitimate. (3) The MRTPC also discounted the possibility of unfair competition on account of PIECO's access to the technology of Phillips, Holland. Specifically, an objection was raised before the Commission that PIECO may surreptitiously import software from Phillips, Holland and pay for this through price adjustments on other transactions. Since other firms do not have access to imported software they are at a disadvantage. To this the MRTPC's reaction was that nothing can be done if PIECO does import software surreptitiously; the best course is to seek an assurance from PIECO that it will not violate my import restrictions and the matter has been treated as closed since PIECO has given the necessary solemn assurance.

In assessing the positions, it must first of all be recognised that no one is doubting the stronger position of Phillips (and hence of PIECO). Indeed, the public sector concerns are worried precisely because they feel that Phillips may swamp them. All the public sector concerns entered into independent collaboration agreements for the analog technology at about the same time. Phillips will bring in the digital technology. The cheaper or superior Phillips product will be a tangible benefit to the con-

sumers, who in this case are power plants and continuous process industries such as steel, cement and paper. The more cost effective functioning of the power plants and other industries must ultimately get reflected in higher incomes all around. But this is not achieved without other costs. It is likely that Phillips with its vast financial resources will initially offer its products at a relatively low price (that may not even cover costs) in order to capture a large share of the market. Once a monopolistic position has been achieved, the prices may be considerably raised. Further, as the appealing public sector concerns have pointed out, there will be a foreign exchange cost and a reduction in pace of technology development in the country. In a more general sense, this is a classic "infant industry" situation where a fledgling local industry is acting (in the interest of national self reliant development) for breathing time to come on par with international competition.

The question then is to what extent will keeping Phillips out help in the saving of foreign exchange and the promotion of indigenous technology development. In other words, will self-reliance be really achieved if multinationals are kept out? The answers are not clear. KELTRON, for example, has a foreign collaboration for which it has to pay. Over the foreseeable future expertise and components and equipment will continue to be imported. If, as is likely, the digital technology is at some stage imported, there will be a further outflow of foreign exchange.

Also, going by past experience (as in the automobile sector), the probability of protected domestic firms acquiring a monopolistic position cannot be considered low.

In either case, it therefore seems that foreign exchange outflow will continue, indigenous technology will grow only slowly and monopolistic positions will be established. The antagonists in this battle are not really MRTPC and Phillips on one side and the public sector concerns on the other. The issues are larger and relate to appropriate methods of indigenous technology development, which may be a casualty in either case. These larger aspects require detailed study. We shall refer to one issue in our concluding remarks.

While from the national viewpoint the position is ambiguous, from KELTRON's point of view the situation is clearer. KELTRON imported a technology and absorbed it with reasonable success. However, in this process it did not receive the desired financial assistance from IDBI which was not convinced of the financial viability of KELTRON's overall operations. The position now is that even the success in technology absorption is likely to have little value since a technology on its way out was imported and the latest technology is being allowed into the country.

II Video Cassette Recorders and Colour TV Monitors

KELTRON's application for a licence for the production of video cassette recorders (VCRs) also suffered a tortuous fate. The

first application was made in June 1975 and as of now no licence has been issued. Meanwhile between 1980 and 1982, 68 parties have been licenced to produce VCRs.

This case shows the arbitrariness of the licencing procedure as well as of the stands taken up by the Department of Electronics (DOE). In 1975-76 the DOE took the view that VCRs were a low priority item with high import content and negligible indigenous technology development. While this view of the DOE may be questioned (as indeed, KELTRON did), it at least has the merit of taking into account serious long term national considerations such as product choice and foreign exchange constraint. These considerations seem to have been given up in the 1980s for no well explained reasons. VCRs are no longer low priority goods and their import implications are no longer serious.

There is arbitrariness not only in the change in attitude to the production of VCRs but also in the decision on the allotment of licences. In 1975-76 the DOE was of the view that there was no indigenous capacity for the head and precision tooling and that this was an important reason for not allowing local production. However, in the 1980s licences have been issued to several small scale units that have no R & D and which may never acquire the advanced VCR manufacturing technology. Indeed many firms are likely to close down after making a fast buck through assembling imported 'kits'. On the other hand, firms with a relatively superior

technological base, such as KELTRON, have been kept out. (That is not to say, ofcourse, that KELTRON has the capability of manufacturing this extremely advanced technology product.)

From the point of view of the firm, a liberal policy (allowing domestic manufacture of a new product) in tandem with a restrictive stance (disallowing a licence to produce that product) has led to a waste of resources (administrative in this case).

Concluding Remarks

The above discussion throws up some issues for more general consideration:

1) KELTRON has had to adopt significantly different postures in its dealings with IDBI and MRTPC. To IDBI, KELTRON emphasised (i) a large market with few suppliers and (ii) its excellent foreign collaboration and import of vital systems first in a fully assembled and then in a semi ~~knocked~~ down condition. To MRTPC, the emphasis was on (i) the already highly competitive market and (ii) indigenous R & D and potential for self reliance. These different postures are only a reflection of the disharmonies in the institutional environment within which the corporate sector works. Such an environment has the effect of diffusing corporate goals or creating genuine dilemmas in corporate operations. In the long run this can restrict corporate growth.

2) A conflict is often posed between greater controls and greater liberalisation. This can sometimes be a false conflict diverting attention from a larger set of issues. Both controls and liberalisation must be seen in a longer term planning perspective. This is specially important in the case of technology development. We pointed out that neither the keeping out of Phillips nor its entry would ensure indigenous technology development. As such, an explicit long term strategy on technology is a prerequisite to any discussion on controls or liberalisation.

In this connection it should be pointed out that "Since its inception, the Department of Electronics has laid great emphasis on the decentralised development of the electronics industry in different regions of the country in a planned, equitable and systematic manner" (DOE, 1978). The major organisational move in this direction has been the setting up of state level promotional agencies in the form of Electronics Development Corporations. Several such corporations have come up in a number of states (KERALA being one of them). This decentralisation has been pursued with the understanding that electronics is a labour intensive industry and can be useful in expanding employment opportunities. While that is true for certain sectors of the industry, it is apparently not true for other sectors (see Ernst, 1981, pp 106-109 for sharply rising capital costs for making semiconductors). The control systems example indicated the need for large technological and marketing resources. In the present context, if the several electronics units take up the manufacturing of control systems there is likely to be considerable waste. Each unit would have to go in for a foreign collaboration and if the units remain of a sub-optimum size the import of technology may become a continuous affair as technology abroad improves. There is therefore need for selective centralisation either through common technology development and marketing institutions and programs or through greater public sector monopoly in the production of critical components and systems.

3) The decision to allow production of VCRs and the felt need within a "development" organisation like KELTRON to manufacture them also raises larger questions of development priorities. It is possible that from the point of view of an individual corporation, like KELTRON, production of VCRs makes sense because of its financial attractiveness. But from the point of view of the economy precious foreign exchange (since the import content is very high) and local resources may be wasted. Moreover, as James and Stewart (1982, p. 251) have pointed out, advanced country, high income products (such as VCRs) "are likely to have inequalitarian effect when introduced to poor countries".

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