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Kerala's Industrial Backwardness: A Case of Path Dependence in Industrialization?

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SUMMARY

The Indian State of Kerala presents a paradox of development, with its remarkable social achievements and relative industrial backwardness. This paper describes Kerala's industrial backwardness as due to a path dependent process of industrialization. A policy decision in the 1930s – marked by a priority for investments in chemicals-based industries and the identification of hydroelectricity as a potential basis for industrialization – continue to have implications for industrial growth in Kerala today. With the policy decision in the 1930s, industrial structure in Kerala came to be locked into a pattern that offered very little potential for inter-industry inter-linkages and industrial growth.

INTRODUCTION

This paper examines some problems of industrialization in the Indian State of Kerala. Kerala, located in the south-west corner of India, comprises a total land area of 39,000 sq km, and has a population of more than 30 million. This State has attracted widespread and well-deserved international attention for its remarkable achievements in social spheres, particularly in the fields of land reform, health, and universal school education (see Ramachandran, 1996). With respect to life expectancy at birth (70.4 years for females in 1993-97), infant mortality rate (14 per 1000 live births in 2000), decline in birth and death rates, and literacy rate (87.9 per

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cent among females above the age of seven in 2001), Kerala is significantly ahead of the rest of India; Kerala is also ahead of China with respect to most of these indicators (Thomas, 2003a). In 1998-99, the median number of completed years of schooling for all persons above the age of six was 7.9 in Kerala; the corresponding figure for India was 4.0 (Chandrasekhar *et al*., 2001, Table 3). It is a feature of Kerala's achievements that in Kerala, more than other Indian States, these achievements have cut across caste and gender barriers, and have been carried to regions across the State (Ramachandran, 1996). Nevertheless, for all these achievements, per-capita domestic product and per-capita manufacturing value added in Kerala are substantially lower than the corresponding figures for India. In 1996, per-capita domestic product at constant (1987) prices was US$314 for Kerala compared to US$380 for India and US$750 for China. In the same year, per-capita manufacturing value added at constant (1987) prices was US$46 for Kerala compared to US$75 for India and US$255 for China (Thomas, 2003a). Industrialization in Kerala, in other words, is certainly far from being commensurate with the socio-economic achievements for which the State is so justly famous.

There are clearly two points of view with respect to Kerala's industrialization. According to the first line of argument, Kerala's industrial backwardness is associated with the high incidence of labor unrest and the active role of trade union movement in the State (Oommen, 1979; Albin, 1990; Thampy, 1990). The second line of argument finds that Kerala's industrial slow down is due to its weak industrial structure, which offers very little potential for inter-industry inter-linkages (Subrahmanian and Pillai, 1986; Subrahmanian, 1990; Subrahmanian, 2003; Thomas, 2003a). A question related to the second line of argument is that why and how did a weak industrial structure emerge and persist in Kerala; this question remains largely unanswered in the literature. The aim of this paper is to attempt to answer this question, using the analytical framework offered by the concept of path-dependence.

The material for this paper is drawn greatly from official records and documents of the Department of Industries, Government of Kerala (which are currently available with the Kerala State Archives Department); proceedings of the legislative assemblies of Travancore and Kerala State; and various State and Central Government (Government of India) publications, including Five-Year Plan documents. This paper is also based on the information I gathered in the course of field visits to major industrial units in Kerala conducted between April 2001 and April 2003.

This paper is organized in eight sections. The next section (section 2) discusses the concept of path dependence. Section 3 briefly examines the features of labor market and industrial sector in Kerala, and, thereby, sets the context for the study. Sections 4 and 5 trace the evolution of the industrial structure in Kerala. Section 4 reviews the period from the mid-1930s to 1950 and section 5 reviews the post-1950 period. Section 6 deals with the problems to growth faced by Kerala's industrial sector. Section 7 discusses alternative paths for Kerala's industrialization, and section 8 concludes the paper.

PATH DEPENDENCE: CONCEPTS AND DISCUSSION

There is a fairly large discussion in literature on the issue of path dependence in economic changes. This discussion relates to how random events or "historical accidents" cause a (economic) system to be "locked in" to some specific path, and, thereby, determine the system's eventual outcome (David, 1985; Arthur, 1994).

The concept of path dependence has useful applications in explaining several economic phenomena. Path dependence explains how among competing technologies or products one particular technology or product emerges and persists as the dominant one. The continued use of QWERTY as the standard keyboard arrangement in typewriters (and computers) for over a century – although it is not necessarily the most efficient one – is often adduced in regard to path dependence (David, 1985). Path dependence theory is also helpful in understanding geographical aspects of economic development, including the question of how industrial activities tend to get concentrated in some particular locations, ahead of other potential locations.[1]

Path dependent sequences appear in the presence of "increasing returns to scale", that is, when small perturbations to a system – instead of diminishing over time – reinforce themselves through "positive feedbacks" (Arthur, 1994, pp.112-3). When do such self-reinforcing positive feedbacks arise? Positive feedbacks arise in the presence of large set-up or fixed costs or in the presence of learning effects. Positive feedbacks can also arise when there are advantages of "going along" with other economic agents while taking a decision or when self-reinforcing expectations exist (David, 1985; Arthur, 1994, pp.112-3; David, 1997).

It is important to note the features of an economy (or any system) in the presence of positive feedbacks. First, the economy or the system settles down to one among the many possible

equilibrium points, and not to any unique outcome. In the 1880s, there were several competing keyboard arrangements – QWERTY being just one among them – anyone of which could have emerged as the standard arrangement in typewriter keyboards. Secondly, the equilibrium point that is finally reached need not be the "best" one – there is "potential inefficiency" in the equilibrium outcome (Arthur, 1994). There are examples of how among competing technologies, the inferior one gains early lead through fortuitous factors and, consequently, remains the market leader. Thirdly, in the presence of positive feedbacks, once a solution is reached, the system gets locked in to that solution; it is difficult to exit.[2] Early advantages to one technology make it very hard for a rival technology to break into the market. Fourthly, small, chance events early in the development of the system determine which equilibrium outcome is finally reached. In this way, historical small events are not forgotten; the solution is path dependent (Arthur, 1994; David, 1985).[3] The decision by William Shockley in 1955 to locate his transistor-producing firm in Silicon Valley, and not in any of the other equally suitable locations, is argued to be a major factor that aided the Valley's later emergence as the leading centre of technological innovation (Kenney and Burg, 1999).

It may be noted that the notion of path dependence does not imply that events are predetermined by, what David (1985, p.332) calls, "happenings dominated by chance elements rather than systematic forces". According to recent literature, path dependence is associated with not only "self-reinforcing", but also "reactive", sequences. In reactive sequences, "initial disturbances do not generate positive feedback [as they do in self-reinforcing sequences] but instead trigger powerful responses that shift the path of a system into a new direction and not one that necessarily reinforces the first move" (Araujo and Harrison, 2002, p.7). This notion of path dependence recognizes, first, historical contingency, or the fact that at any given point events can follow one among the various possible paths, each path leading to a different eventual outcome. Secondly, it recognizes the role of agency, that is, at each point "strategically reflexive, temporally oriented actors" will reflect on the consequences of following the various possible paths and choose a path that serves their interests. According to this notion of path dependence, outcomes are contingent results of the interplay between agents on the one hand and structures, which are "carriers of history", on the other (Araujo and Harrison, 2002).

As will be shown below in the case of Kerala, the concept of path dependence is relevant to explaining the variations in outcomes in the process of industrialization.

THE CONTEXT FOR THE STUDY

(a) Salient features of Kerala's labor market

Industrialization in Kerala has been particularly unsuccessful with respect to generating employment opportunities for the relatively educated workforce in the State. In 2001, of the total 10.3 million workers in Kerala, 7.9 million workers were engaged in non-agricultural activities, and only 0.3 million workers were employed in the factory sector.[4] The proportions of non-agricultural workers to total workers and of factory sector workers to total workers have been, respectively, 76.7 per cent and 2.9 per cent in Kerala compared with 41.6 per cent and 2.0 per cent in India.[5] Within the factory sector of Kerala, a large part of the workforce (45.9 per cent in 1994-95) is employed in cashew processing and beedi making, industries that still employ traditional technology. Kerala's labor market in the post-1950 period is characterized by decline over the decades in "main workers" as a proportion of total population and the highest rates of unemployment in the country (Thomas, 2003a). In 1999-2000, unemployment rates among economically active population were 10.9 per cent and 12.5 per cent respectively in rural and urban areas in Kerala; the corresponding national averages were 1.9 per cent and 5.2 per cent respectively.[6]

Migration of workers to countries in the Gulf region (as opportunities opened up in West Asian countries for construction jobs after 1973) is an important feature of Kerala's labor market, one that has provided a major source of employment for workers from the State. According to Zachariah *et al.* (1999), there were 1360,000 emigrants from Kerala in all foreign countries by the second half of 1998. This means that, by 1998, the number of workers from Kerala working outside India was larger than the number of workers in the organized sector in the State (1220,000). Also, between the early 1980s and late 1990s, the number of workers from Kerala employed abroad increased by approximately 1000,000, while the number of organized sector workers in the State increased by only 230,000, and the number of factory sector workers in the State increased by only 71,000 (see Thomas, 2003a).

(b) Key features of structure and growth of Kerala's industrial sector

Kerala's share in the total value added by India's factory sector (which has always been lower than Kerala's share in India's population) has fallen over the years (see Figure 1).

According to data from India's Annual Survey of Industries (ASI), two industries -- chemicals and rubber-based industries – dominate value added in the factory sector and two industries -- cashew processing and beedi making – dominate employment in the factory sector of Kerala. ASI data shows that, in 1994-95, Kerala was 11th among 15 Indian States in diversification with respect to the number of constituent three-digit industries in the factory sector. As per the ASI data, the presence of metal based industries, and machinery and transport equipment manufacturing industries in Kerala's industrial sector are less than proportionate to the countrywide average.

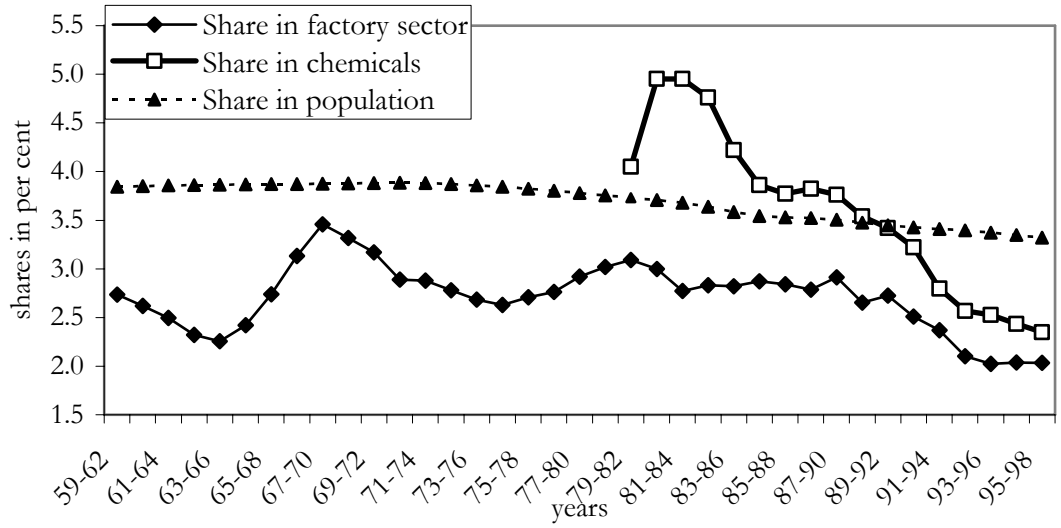

Figure 1. *Kerala's share in India in total population, in gross value added by factory sector, and in gross value added by chemical industry, 1959-62 to 1995-98 (in percent)*

Notes: Gross value added is at constant (1981-82) prices. Chemical industry refers to the two-digit industry group 30 according to NIC 1987.

Source: Annual Survey of Industries, results for factory sector, various issues; *Statistical Abstract of India*, various issues.

In 1995-98, chemicals and rubber-based industries (industry groups 30 and 31 according to the National Industrial Classification (NIC) 1987) together accounted for 38.9 per cent of the total value added by Kerala's factory sector (ASI data). However, diversification *within* two-digit industry groups 30 and 31 has been rather limited in Kerala. Chemical industry in Kerala has not diversified beyond heavy chemicals to downstream petrochemicals or synthetic fibers. According to Annual Survey Industries data for the year 1994-95, there were 44 four-digit industries within the two-digit industry group chemicals (30) in India. Only 15

of these four-digit industries had a presence in Kerala in that year; the corresponding number for Maharashtra was 38. In sum, it can be said that the industrial structure of Kerala is relatively small in size and not very diversified.

Kerala's industrial sector has been falling below the Indian average in growth performance. In a distribution of rates of growth of value added by the factory sector across 15 Indian States, the rate of growth in Kerala was at the 69th percentile in the 1960s (1959-60 to 1969-70), 23rd percentile in the 1970s (1970-71 to 1978-79), 8th percentile in the 1980s (1979-80 to 1990-91), and at the 23rd percentile in the 1990s (1991-92 to 1997-98) (ASI data for various years).[7] The 1980s and 1990s were periods of a slower influx of industrial investments to Kerala. In a distribution of rates of growth of fixed capital stock by the factory sector across 15 Indian States, the rate of growth in Kerala was at the 38th percentile in the 1960s, 77th percentile in the 1970s, 23rd percentile in the 1980s, and at the 31st percentile in the 1990s. Between 1959-62 and 1995-98, profit as a proportion of output declined in Kerala's factory sector, from 14.9 per cent to 10.2 per cent; it increased in India's factory sector between these two time periods, from 12.4 per cent to 13.5 per cent (ASI data for various years).

It is of note here that, irrespective of the stagnancy in industrial growth, growth of per capita income of Kerala accelerated after the late 1980s. Per capita income of Kerala grew at an annual rate of only 1.88 per cent during the period between 1960-61 and 1972-73, and at statistically insignificant rates during the period from 1973-74 to 1987-88. Between 1988-89 and 1997-98, the annual growth of per capita income in Kerala accelerated to a rate of 4.6 per cent, a rate that was faster than the corresponding rate of growth in India, which was 3.6 per cent. The real engines of Kerala's economic revival after the late 1980s were construction and services; and within the service sector, transport and financing services in particular. It is also important to note that per capita consumption expenditure in Kerala is higher than the corresponding national average; per capita consumption expenditure in rural Kerala was 56 per cent higher than the corresponding level for rural India in 1999-2000. This is reflection of the impact of remittances from workers in Gulf countries (which are not included in calculations of income growth discussed above) on Kerala's economy (Thomas, 2003a).

(c) Explaining Kerala's industrial backwardness

Scholars have evaluated and explained Kerala's industrial backwardness in different ways. The radical nature of politics and labor relations in Kerala is often singled out as being the cause of the State's industrial backwardness. This view is widely held in the general discussions on Kerala within and outside the State (see Oommen, 1979; Thampi, 1990; Albin, 1990). In a recent study, Thomas (2003b) notes that an outstanding feature of labor organization in Kerala is that it brought in informal-sector workers into its fold, while informal-sector workers in other parts of the country continue to survive under oppressive working conditions. As wage rates of informal-sector workers in Kerala rose above the corresponding Indian average and above the corresponding wage rates in neighboring States, Kerala, apparently, lost its advantages in industries that are based on cheap and unskilled labor and in industries that can relocate themselves easily, including, importantly, cashew-processing industry. At the same time, Thomas (2003b) showed that, in Kerala's factory sector as a whole, between 1959-60 and 1997-98, number of mandays lost in strikes and lockouts per worker was not associated with important parameters of industrial growth, including annual rate of change in employment or annual rate of change in labor productivity. Annual growth of employee earnings in Kerala's factory sector was found to be positively associated with annual growth of labor productivity, more than in 13 other Indian States. Thomas (2003b) thus clearly disputes the general suggestion that industrial slowdown in the State is "caused" by labor problems.

Some scholarly studies trace Kerala's industrial backwardness to a weak industrial structure (see Subrahmanian and Pillai, 1986; Subrahmanian, 1990; Subrahmanian, 2003; Thomas, 2003a). Kerala's modern industrial sector and its chemical industry in particular are characterized today by low level of diversification and low scales of production operation, at the level of individual plants as well as at the level of whole industries. Kerala's share in total value added in India's chemical industry was 4 per cent in 1979-82 and declined to 2.3 per cent in 1995-98 (see Figure 1). At the same time, Maharashtra and Gujarat, the two most industrialized States in the country located in India's west, had a combined share of 60 per cent in India's chemical industry in 1995-98 (ASI data, various years).

Thomas (2003c) showed that potential economies of scale exist in India in chemicals (two-digit industry group 30) and in some other industries. Maharashtra, Gujarat, and some other

Indian States have realized potential economies of scale in the chemical industry. Given the small scale of production of output, Kerala was unable to realize the potential economies of scale in the chemical industry. The failure of the major industry in Kerala (i.e., the chemical industry) to achieve significant economies of scale has affected the growth performance of the whole factory sector of Kerala. It was found that, during the period from 1959-60 to 1997-98, Kerala fell behind most other Indian States in a "cumulative cycle of growth differences" in India's factory sector, a process of regional growth differences in which industrial sectors of a few States achieved economies of scale and continuously increasing growth, whereas industrial sectors of a few other States, which did not achieve economies of scale, experienced continuously declining growth (Thomas, 2003a; Thomas, 2003c).[8]

As will be shown below, the chemical industry (and within it, heavy chemicals) is one in which Kerala had no specific advantages with regard to the availability of raw material or the potential to establish backward and forward linkages. This explains the failure of chemical industry in Kerala with respect to expansion and growth. Previous studies that associate Kerala's industrial backwardness to its weak industrial structure have not answered the question as to how and why did an industrial structure dominated by chemicals emerge and persist in Kerala. The paper attempts to fill this gap in the literature; it does so by examining industrial policies and nature of investments in industry in Kerala from the 1930s in the context of the concept of path dependence.

HISTORICAL EVENTS AND INDUSTRIAL STRUCTURE: THE PERIOD FROM MID 1930s TO 1950

Before India became an independent republic in 1950, the geographical entity that constitutes present-day Kerala comprised three regions: the princely states of Travancore and Cochin, and Malabar. These regions were directly or indirectly under the political supremacy of colonial powers, particularly the British. Investments in modern industries began in the Alwaye–Kochi region in the princely state of Travancore after the mid-1930s. These investments were made largely by a few immigrant capitalists, many of them belonging to the neighboring Madras Presidency. Encouragement by the Travancore administration and the wartime boom in demand for industrial goods were factors that aided this investment flow.

The modern industrial units that were established in Travancore after the mid-1930s made significant changes in Kerala's industrial structure, which consisted of only traditional industries until then. Trivandrum Rubber Works, manufacturing cycle tires and tubes, was opened in 1935; Indian Aluminium Company (IAC) set up what was to become the first aluminium smelter in India in Alwaye in 1943; Fertilizers and Chemicals Travancore Limited (FACT), the first major fertilizer plant in the country, was established in 1944.[9] Many of the new industrial units produced heavy chemicals or chemical-based products. These include Travancore Electrochemical Industries Limited (TECIL), started in 1945; Travancore Titanium Products (TTP), started in 1946; and Travancore Cochin Chemicals (TCC), started in 1951. Interestingly, many of the industrial units established in Travancore after the mid-1930s were pioneers in India in their respective fields of industrial production.

Industrial units established in Travancore after the mid-1930s have laid the foundations of Kerala's modern industrial structure. Many of these industrial units are, even today, the major industrial units in Kerala; the chemical industry, the major area of industrial investments in Travancore after the mid-1930s, is still the dominant modern industry in Kerala.

It is argued here that the investments in Travancore in industrial units producing heavy chemicals and aluminium metal were led by of two historical factors. First, there was a change in industrial policies of the Travancore administration in favor of large-scale industries after the 1930s. Secondly, the availability of hydroelectricity was considered to be a potential basis for industrialization.

(a) Industrial policies of the Travancore administration

The Travancore administration did not consider setting up large-scale industries until the 1930s (Isaac and Tharakan, 1986; Rammohan, 1996). According to Rammohan (1996, ch.4), the state in Travancore had actively intervened in industrial development during the period 1914-30, as had the governments of certain other princely states in India during this period. However, the policy interventions in Travancore were aimed at reviving small-scale and cottage industries like handloom weaving, making use of local capital and resources (Rammohan, 1996; Bright Singh, 1944). Interestingly, political and commercial interests in Travancore during the period endorsed the governmental policy of encouragement to small-scale industries and apathy towards large-scale industries. The following statement from the

1924 budget of Travancore administration is evidence of the Government's point of view in this decade preceding the establishment of factory industries:

> it seems to the government that we shall be making a serious mistake if we expend our energy and resources for the development of factory industries in Travancore. Our industrial efforts might, with advantage, be directed towards the development and creation of cottage industries.[10]

From the late 1930s, the Travancore administration reversed its earlier policy, and actively encouraged the development of large and medium-scale industries (Isaac and Tharakan, 1986; Rammohan 1996). Inaugurating the Trivandrum Rubber Factory in 1935, the *Maharajah* (supreme ruler) of Travancore said, "the needs of a growing population [in Travancore] demand a supplementing of [Travancore's] income and resources by the encouragement of industrial pursuits" (Bright Singh, 1944, p. 476).

The changes in the industrial policies of Travancore are generally attributed to the *Dewan* (chief administrator) of Travancore Sir C. P. Ramaswamy Aiyer. Isaac and Tharakan (1986, pp.19-26), however, argue that public opinion in Travancore had turned by the 1930s in favor of large industries, and public opinion pressurized the administration to make the policy changes.

The favorable conditions for industrial development that emerged in India after World War II began are likely to have contributed to the increase in investments in industry in Travancore and the change in industrial policies of the Travancore administration. The outbreak of the War in 1939 led to an increase in the demand for domestically produced industrial goods, after imports of industrial goods stopped flowing in to the country because of the war. Investments in industry – mostly by Indian entrepreneurs – during this period also took place in princely states such as Gwalior, Mysore, Hyderabad, Baroda and Travancore. Princely states were characterized by relatively lower wages, lax labor regulations, state patronage and a more attractive tax structure than British India (Mahadevan, 1991, pp. 189-97; Rammohan, 1996, ch.4).

(b) Availability of hydroelectricity as a basis for industrialization

An important stimulus for industrial investments in Travancore in the period after the mid-1930s was the advantage offered by the availability in Travancore of hydroelectricity.

One important reason for delayed industrialization in Kerala – indeed in south India –was the absence of local deposits of important metallic minerals and fossil fuels.[11] Coal reserves were located in India's eastern region; mineral oil had to be imported from Burma or Iran; and although the railway system was well-developed, the high transportation charges involved in carrying fuel and raw material over long distances was a serious constraint to industrial development of the southern region.[12] Wood and hydroelectricity were considered to be the only sources of energy available to the entire southern region.[13]

Given this general context, the starting of Pallivasal Hydro-electrical project in the 1930s was something of a trigger for Kerala's industrialization. The construction work for the project, on a tributary of the Periyar River, began in 1932; the first stage of the project was commissioned in 1940, with an effective plant capacity of 9000 KW (kilowatt).[14] The availability of hydro-electricity, which is a relatively cheap source of energy, was expected to give a major boost to the prospects of Travancore's industrial and economic development. While inaugurating Trivandrum Rubber Factory in 1935, the Maharajah of Travancore expressed the view that Kerala's potential for industrial development lay in its "abundant supply of raw material, [its] cheap labor and transport facilities…and electric power, which is available in sufficient quantities." [15]

By the 1940s, industrial development in Travancore meant the development of large-scale industries. This change of perception is best seen in the pattern of allocation of electricity among different types of consumers. A few large-scale industries accounted for very high shares of the total electricity consumed in Travancore. The smelter established by IAC alone consumed over 50 per cent of the electricity generated in Travancore. More importantly, the tariff rates charged to this company were only 20 per cent of the rates charged for domestic consumption.[16] The requirements of small-scale industries and agriculture were apparently overlooked in the distribution of electric power.[17]

To the capitalists who invested in large-scale industries in Kerala, the availability of electric power at very low rates appeared highly attractive, so much so that they overlooked the

unsuitability of the region for their investments in several other respects. This is best illustrated in the establishment of IAC's smelter in Alwaye. There are different stages in the production of aluminium. Bauxite, the basic raw material, is first converted into alumina; alumina is then reduced to aluminium ingots in an electrolytic process in a smelter plant; aluminium ingots are processed in rolling mills to produce sheets and circles, which, in turn, are used in aluminium-consuming industries. In the late 1930s, bauxite reserves were abundant in India's eastern region, and the major aluminium consuming industries, utensil-making plants for example, were located in Calcutta (now Kolkata) (in India's eastern region). It was only natural then for IAC to locate its plant converting bauxite to alumina in Muri in eastern India and its rolling mill in Calcutta. However, the smelter plant, whose operations require large quantities of electricity, was located in Alwaye in Kerala – disregarding the high costs involved in transporting alumina from Muri to Alwaye and transporting aluminium ingots back to Calcutta – in order to make use of the cheap hydroelectric power from Pallivasal project.[18]

(c) Travancore as a location for investments in industries producing chemicals or intermediate goods

Industrial units that were established in Travancore after the mid-1930s produced, to a large extent, intermediate goods, particularly chemicals. Because of investments in chemicals-producing industrial units, Travancore (and later Kerala) came to be an important centre of India's chemical industry in the 1940s and 1950s. Kerala was the first producer in India of several chemicals, including rayon grade caustic soda, battery grade ammonium chloride, calcium carbide, sodium hydrosulphide, potassium chlorate, rare earths compounds and titanium dioxide (De Sousa, 1961, pp.124-5, 220-4). FACT was the first major fertilizer plant in India; its annual production capacity of 45,000 MT (metric ton) of ammonium sulphate was the largest in the country when it started production in 1948. Kerala was also a major producer of sulphuric acid; in 1952, the State accounted for 30 per cent of the total production of the acid in India (De Sousa, 1961, p.175).

However, given the low levels of local demand for chemical products and also the absence in Kerala of raw material required in the production of chemicals, Travancore of the 1940s was not a location greatly suited for such major investments in the chemical industry. Until 1939, India did not produce heavy chemicals in any large quantities. The demand for heavy chemicals from industries like textiles, dyestuffs, vegetable oils, soaps, glass and drugs was

not very large, as the development of these industries in the country was rather limited until then. More importantly, the demand for chemicals came mostly from the few large industrial centers in the country, particularly Bombay (now Mumbai). Because of such restricted demand, the Tariff Board of 1929 was clearly against the dispersal of heavy chemical industries in India. The Board even recommended the establishment of a single, large manufacturing unit to cater to the whole national market and thus reap the advantages of economies of scale (Sengupta, 1937, p.40; All India Manufacturers' Organization (AIMO), 1945, pp. 5-8). [19]

Travancore in the mid-1930s was not a location suited to take advantage of the demand for chemical products that then existed in India. It is located at the southernmost corner of the country, far away from the major industrial centers like Bombay. Industries consuming heavy chemicals such as textiles or soap were ill-developed in Kerala. Moreover, there are no local reserves of the raw material required as inputs for the heavy chemical industry. Bauxite, coal and iron reserves were located in Bihar, Orissa and the Central Provinces; salt required for alkali industry was available in Saurashtra, Rajaputana and Punjab; pyrites in Bihar, Uttar Pradesh and Mysore; and limestone in Central Provinces, Assam, Bihar and Uttar Pradesh. [20] The only notable advantage that Kerala possessed in the development of chemical industry was – as shown above – the availability of hydroelectricity.

"LOCK-IN" OF THE INDUSTRIAL STRUCTURE: THE PERIOD AFTER 1950

In post-1950 Kerala, the main incentive offered by the State Government to investors continued to be the availability of cheap hydroelectricity. Chemicals and other intermediate goods continued to be the major area of industrial investments. In other words, industrial structure in Kerala came to be locked into the pattern of industrial investments in the State in the pre-1950 period.

After the State of Kerala was formed in 1956, the newly elected State Government identified food shortage and unemployment as the two major economic problems facing Kerala. According to policy makers of the new State, industrialization was the only long-term solution to the problem of unemployment, particularly the problem of educated unemployment, in Kerala. Successive governments in Kerala were also convinced that the

thrust of Kerala's industrialization should be directed to the building of large-scale industries.[21]

In the post-1950 period, in Kerala as in other Indian States, there have been three important players in industrial development: the Government of India, the State Government and the private sector. Among these three players, the Central Government has had the most prominent role. Direct investment in industry in Kerala by the Central Government has always been less than proportionate to Kerala's share in India's population. Kerala's share in total direct investment in industry by the Central Government was 0.00 per cent, 0.11 per cent, 1.53 per cent and 1.53 per cent respectively in the five-year plan periods of 1951-56, 1956-61, 1961-66 and 1969-74. Kerala's share in the assets (cumulative) of all Central Government public sector enterprises was 2.71 per cent in 1975-76, 2.28 per cent in 1980-81, 1.43 per cent in 1990-91 and 1.69 per cent in 1998-98. At the same time, during the period from 1951-52 to 1997-98, Kerala's share in India's population ranged between 3.9 per cent and 3.3 per cent.[22] Assistance by financial institutions controlled by the Government of India and the number of industrial licenses issued to Kerala have each been less than proportionate to Kerala's share in India's population (Thomas, 2003a).

Planned development by State Governments is dependent, in great measure, on financial transfers from the Central Government. In India, financial transfers from the Centre to the States have been low and declining over the years. The growth of Central transfers to the States decelerated from 14.6 per cent in the 1980s to 11 per cent in the 1990s (Rao, 2002). This has reduced financial autonomy and the freedom of intervention in industrial development of all Indian States, including Kerala. The Government of Kerala invested a larger proportion of its total plan outlay on industry than State Governments in other Indian States; the consequence, however, appears to have been to have spread limited resources thin.

When the State of Kerala was formed in 1956, the political leadership of Kerala was determined to bring in industries in the private sector as, according to E.M.S. Namboodiripad (a Communist and leader of the first State Government ministry that took charge in 1957), "the possibility of industrialization through the public sector was not very bright in Kerala" (Ramachandran, 1998). A few large business houses, whose headquarters and major bases are

outside Kerala, dominated private sector investments in Kerala; over the years, their business interests in Kerala have waned. A class of big industrial entrepreneurs did not emerge in Kerala. There can be several historical reasons for this, which deserve to be investigated further, but it is found that the licensing system in India played a part in dampening industrial entrepreneurship in Kerala (Thomas, 2003a). In 1999, of the total investment in large and medium-scale industries in Kerala, the private sector accounted for 41.8 per cent, Central Government public sector for 43.3 per cent and State Government public sector accounted for 11.6 per cent.[23]

Given the context outlined above, the two important features of investment in industry in post-1950 Kerala may be examined here.

(a) Hydroelectricity as the continuing stimulus for Kerala's industrialization

After the formation of Kerala State, State Governments repeatedly emphasized that, with regard to the future of industry in the State, Kerala's natural resources and hydroelectricity were its chief advantages. While appealing in the budget speech of 1959-60 for Central Government participation in Kerala's industrialization, the Finance Minister of Kerala listed rubber, bamboo, forests, herbs, clay and mineral sands as Kerala's important natural resources, and urged the Centre to "encourage industries that use these raw materials."[24]

The expansion of power generating capacity has been a major component in Kerala's development strategy after 1950. Large shares of the State's total Plan outlay in different Five-Year Plan periods have been spent on power generation. A Government report noted in 1970 that the increase in total power generating capacity from 18.5 MW (megawatt) to 546.5 MW was the outstanding achievement of economic planning in Kerala (Government of Kerala, 1970). The report by National Council of Applied Economic Research (NCAER) (1962, pp.110-23) recommended that, given the abundance of hydroelectric power resources in the State, Kerala should consider power generation itself as an industry and sell power to other Indian States. According to the State Electricity Department, Kerala was power surplus from 1966, when the Sabarigiri project was commissioned, until 1982, when the State had to go through the first major power cut (State Planning Board, 1984b, p.26). Kerala exported electric power to other Indian States during this period.

Successive State Governments in Kerala attempted, as had the Travancore Government in the 1940s, to bring in large-scale industries, particularly power-intensive industries, to the State by offering major concessions on electricity tariff rates. The average price of electricity in Kerala has always been lower than the countrywide average because generation costs of hydroelectricity are, in general, lower than for thermal electricity (the major source of electricity generation in India) (see Table 1). In addition electricity prices in Kerala discriminate greatly in favor of large industrial consumers: until 1980-1, the price of electricity in Kerala was the lowest for extra high-tension (EHT) and high-tension (HT) industrial consumers, lower than even the prices charged from agricultural consumers (see Table 2). Of course, a justification for such a pattern of pricing was that, being bulk consumers of electricity and having high load factors, the cost of transmitting electricity to EHT and HT consumers is low. But the pattern of electricity pricing in Kerala was also motivated by the official policy of the Government of Kerala to encourage large, power-intensive units. Official thinking in this regard is well reflected in a letter from the Chairman of Kerala State Industrial Development Corporation (KSIDC) to the State's Industries Department in 1965. The chairman wrote that, given Kerala's "disadvantages" (such as its location at the southernmost corner of the country), the supply of cheap electric power was the "most effective instrument [to attract] entrepreneurs from outside Kerala, [to establish] large-scale industrial units, particularly electricity-based ones like aluminium, zinc, caustic soda, etc." in the State.[25]

Table 1. *Average electricity tariffs, various categories of consumers, Kerala and India, 1998-99 (paise/kilowatt hour)*

	Categories of consumers				
	Domestic	Commercial	Agriculture/ Irrigation	Industrial	Overall average
Kerala	83.44	295.7	55.1	165.9	173.2
India	131.1	345.29	29.66	297.53	197.85

Source: reported in Tata Energy Research Institute (TERI) (1999), Table 24, p.120.

Table 2. *Average electricity tariffs in Kerala, various categories of consumers, different years (paise/ kilowatt hour)*

Categories of consumers	1971-72	1980-81	1990-91	1999-2000
Domestic	39.4	33.2	43.0	81.0
Commercial	41.2	49.2	76.0	436.4
Industrial (LT)	17.8	27.4	69.0	241.1
Industrial (HT& EHT)	4.7	9.7	54.0	221.7
Agriculture	11.9	18.2	25.0	67.2
Overall average	9.5	21.2	60.0	165.8

Source: Kerala State Electricity Board (2000), p.32, Table 24.

Most industrial units established in Kerala in the 1960s and 1970s were based on the intensive use of electric power. Indian Aluminium Company (IAC) continued to get major concessions in electricity tariffs after 1950. The rates at which the State Government directed Kerala State Electricity Board (KSEB) to supply power to the company in the early 1960s was uneconomically low for KSEB, and even raised questions from the industrial licensing committee of the Government of India.[26] For TCC, the price of electricity in Kerala was low enough to compensate the cost disadvantage arising from the transportation of raw material (in this case, salt) from Gujarat.[27] Cominco Binani Zinc Limited (later Binani Zinc Limited) located its zinc smelter in Kerala mainly because KSEB had agreed to supply power uninterruptedly to the company.[28]

EHT industrial consumers, which are a few large industrial units mostly in the Alwaye-Kochi belt – 38 industrial units in 2000 – thus consumed very large shares of the electricity produced in Kerala, particularly until the 1970s.[29] In 1970-71, industrial consumers (EHT, HT as well as low tension (LT) consumers) accounted for 82.6 per cent of the total electricity sales in Kerala; the corresponding figure for the country as a whole was 67.6 per cent. However, the share of industrial consumers in the total electricity consumption of Kerala declined sharply over the 1980s and 1990s: from 70.2 per cent in 1980-81 to 33.0 per cent in 1997-98. The share of domestic consumers in total electricity sales in Kerala increased from 16.3 per cent in 1980-81 to 49.4 per cent in 1997-98. The share of agricultural consumers in total electricity sales in Kerala has always been low: in 1997-98 it was a meager 4.4 per cent in Kerala, at a time when the all-India figure was 30.7 per cent (see Table 3).

Table 3. *Shares of various categories of consumers in total electricity sales in million kilowatt hour, Kerala and India, different years (in per cent)*

Categories of consumers	1951		1960-61		1970-71		1980-81		1990-91		1997-98	
	Kerala	India	Kerala	India	Kerala	India	Kerala	India	Kerala	India	Kerala	India
Domestic	8.2	12.4	10.5	10.7	6.6	8.8	16.3	11.2	31.1	16.8	49.4	20.3
Commercial	1.6	6.9	0.8	6.1	4.6	5.9	7.0	5.7	9.7	5.9	8.7	6.5
Industrial	83.7	63.8	81.6	69.5	82.6	67.6	70.2	58.4	51.6	44.2	33.0	35.4
Industrial (LT)	--	--	--	--	--	9.0	8.1	9.0	6.8	9.2	7.0	7.7
Industrial (HT& EHT)	--	--	--	--	--	58.7	62.1	49.4	44.8	35.1	26.1	27.7
Agriculture	3.7	4.2	3.8	6.0	2.7	10.2	2.9	17.6	3.9	26.4	4.4	30.7
Total sales	100	100	100	100	100	100	100	100	100	100	100	100
Total sales (in million KWh)	168	4793	486	13953	1525	43724	2756	82367	5274	190357	7684	296749

Source: *Public Electricity Supply*, General review, All India statistics, various issues.

(b) Continuing investments to chemicals and other intermediate goods

Investments in industry in Kerala after 1950 continued to be directed mainly towards chemicals and other intermediate goods. Direct investment in industry in Kerala by the Central Government has been almost entirely in chemicals. The largest share of direct investment in industry by the Government of Kerala also went into chemicals. Moreover, the State and Central Governments have greatly encouraged private sector investment in the chemical industry. The emphasis on investments in the chemical industry was not, however, accompanied by investment in projects representing backward and forward linkages with respect to the chemical industry.

It was noted in section 4 that in the 1940s a sufficiently large market for chemical products did not exist within Kerala. There was no substantial change in this respect after 1950. Given the limited market for chemical products within Kerala, the expansion of many of the originally established chemicals-producing industrial units in Kerala was dependent on the simultaneous emergence of chemicals-consuming industries in the region. Of course, Kerala could sell its products to chemicals-consuming industries in other Indian States, for example, leather industry in Tamil Nadu.[30] However, Kerala's location at the southern-most corner of India, costs and difficulties involved in transporting heavy chemicals, absence of any real

advantages to Kerala in production of heavy chemicals, and competition from the bigger chemicals-producing industrial sectors of Maharashtra, Gujarat and Tamil Nadu have been factors that worked against this.[31]

In several instances, an important justification for starting a new chemicals- producing (and chemicals-consuming) industrial unit in Kerala was that it created a source of demand for the existing industrial unit. For example, several industrial goods began to be produced in Kerala in order that the new line of production would generate a source of demand for the products of TCC. From its early days, TCC faced difficulties in selling its products, particularly chlorine. When FACT expanded its operations to the production of ammonium chloride, in which chlorine is used as a raw material, it did so partly in order to consume the chlorine produced by TCC. License approval for the third stage expansion of TCC depended critically on the third stage expansion of FACT.[32] In connection with TCC's application for expansion, Union Minister for Industries wrote to the State Minister for Industries on the importance of finding markets for the products of TCC.[33] TCC justified its third stage expansion plans by indicating that Travancore Rayons and Gwalior Rayons were to be its major consumers.[34] An important consideration in establishing Travancore Rayons near Alwaye was the availability of caustic soda from TCC and a few other chemicals from FACT (Baldwin, 1959, pp.270-277). When proposals were floated in the late 1960s to start a new newsprint mill in Kerala, an important benefit perceived from the proposed project was that it would create one more consumer for TCC, which was then finding it difficult to sell its products.[35] Many chemicals-producing industrial units in Kerala were thus built on each other's demand, and on the availability of cheap hydroelectricity.

PATH DEPENDENCE AND "INEFFICIENT" OUTCOMES IN INDUSTRIALIZATION

The expansion of modern industrial sector in Kerala has been constrained by several factors. The more prominent of these factors are linked to the very nature of investments in industry in modern Kerala. First, although the availability of electricity was publicized by the Governments of Travancore and Kerala as being the major incentive offered to establish industries in the State, the shortage of electric power later became the single largest constraint to the expansion of Kerala's modern industrial structure. Secondly, chemicals-producing industrial units, the major area of industrial investments in Kerala, have been facing difficulty in marketing their products.

(a) Insufficient availability of electric power and problems to industrial development

Contrary to what was believed in the initial decades of planning, Kerala was (and still is) not power surplus. Although the State has sought to attract power-intensive industries with exceptionally low tariff rates, it simply cannot any longer sustain electricity supplies to such industries. The growth of electric power potential in Kerala has been slow – slower than in India over the 1980s and 1990s. Total installed power generating capacity in Kerala increased from 1012 MW in 1980-81 to 1771 MW in 1997-98, an increase of only 75 per cent; the corresponding increase in India during the same period was 195 per cent, from 30214 MW to 89102 MW (see Table 4).

Table 4. *Installed power generating capacity (utilities only) in Kerala and India, prime mover-wise (in megawatt)*

Years	Hydro		Steam		Gas		Total		(1) as % share of (2)
	Kerala	India	Kerala	India	Kerala	India	Kerala (1)	India (2)	
1951	29	575	4	1098	0	163	33	1835	1.8
1960-61	133	1917	5	2436	0	300	137	4653	2.9
1970-71	547	6383	0	7508	0	168	548	14709	3.7
1980-81	1012	11791	0	17122	0	274	1012	30214	3.3
1990-91	1477	18308	0	41237	0	2343	1477	63636	2.3
1997-98	1689 (95)	21905 (25)	0 (0)	55970 (63)	0 (0)	7661 (9)	1771 (100)	89102 (100)	2.0

Notes: Figures given in brackets in the last row indicate the shares of power generating capacity by the different prime movers in the total power generating capacity.
Source: *Public Electricity Supply*, General review, All India statistics, various issues

It has been argued that even in the period before 1980, when Kerala was declared by the State Government to be power surplus and was encouraging investments by power-intensive industries, the situation was not in fact one of a surplus of supply over demand. Domestic demand was suppressed by the absence of an adequate transmission and distribution network (Prasad *et al*., 1979, pp. 21-23). The Kerala State Planning Board (1984b, pp. 104-6) noted in 1984 that voltage levels and power supply conditions in Kerala were unsatisfactory and that State Plan allocations in Kerala for power transmission network were unjustifiably low during the Fourth, Fifth, and Sixth Plan periods.

Kerala faced a major power shortage in the 1980s. In 1982-83, the power shortage coincided with drought conditions in the State in that year. Power cuts and rationing have been frequent

in Kerala continually since the 1980s. In 1997-98, the overall average per capita electricity consumption in Kerala was less than half the corresponding Indian average (see Table 5).

Table 5. *Average per-capita electricity consumption by different categories of consumers, Kerala and India, 1997-98 (in thousand kilowatt hour)*

	Domestic	Commercial	Industrial-LV & MV	Industrial-HV	Agricultural	Overall average
Kerala	0.95	0.8	5.77	1267	1.05	1.46
India	0.81	1.81	9.03	1643	7.93	2.96

Note: LV is low-voltage, MV is medium voltage, and HV is high-voltage.
Source: *Public Electricity Supply*, General review, All India statistics, various issues

As of now, hydroelectricity is the most easily available source of electric power in Kerala. According to the State Planning Board (1984b, p.26), Kerala has a hydroelectric potential of 3000 MW at a 60 per cent load factor. However, there have been major hurdles to realizing this hydroelectric potential of Kerala. Kerala is a narrow stretch of land, its width varying from 32 to 120 kms from the Arabian Sea in the West to the Western Ghats in the East. Given its topography, and given also that Kerala's rivers are monsoon-fed, only storage hydroelectric schemes are feasible for the State. Proposals for storage schemes, however, have raised serious protests by environmental groups in Kerala. Delays in the construction of power projects were another hurdle to the realization of Kerala's power generating potential (see Pillai and Kannan, 2001).

Problems related to shortage of electric power have been particularly severe in the case of heavy chemical industries, as they are, by nature, relatively power-intensive than labor intensive. According to Annual Survey of Industries data for the year 2001-02, the proportion of value of fuels consumed to value of output and the proportion of cost of labor to value of output were, respectively, 12.2 per cent and 3.8 per cent in the case of manufacture of heavy chemicals (three-digit industry group 241 according to NIC 1998) compared with 6.2 per cent and 5.3 per cent in the case of factory sector as a whole.[36]

Individual industrial units in Kerala have, at different times after 1950, faced power shortages that sometimes lasted several months, as well as short, undeclared, yet frequently occurring power and voltage interruptions. Evidence in this regard came from an examination of the annual reports of FACT from 1946 to 2000 for every instance of major production loss.

Reasons cited by the Company for the production loss has been then recorded; the results of this exercise are reported in Table 6. The shortage of electric power has been a very important reason for the industrial stoppages in FACT.

Table 6. *Reasons for instances of major production losses, Fertilizers and Chemicals Travancore Limited (FACT), 1946-2000 (in per cent)*

Reasons for production losses:	1946-60	1961-70	1971-80	1981-90	1991-2000	1946-2000
Power shortage	38.9	45.5	29.2	33.3	29.4	34.1
Industry-wide factors*	5.6	0.0	33.3	11.1	35.3	19.3
Plant failures & breakdown	11.1	27.3	16.7	22.2	11.8	17.0
Raw material shortage	22.2	18.2	8.3	5.6	11.8	12.5
Labor problems	22.2	0.0	12.5	5.6	0.0	9.1
Other reasons	0.0	9.1	0.0	22.2	11.8	8.0
All reasons	100	100	100	100	100	100
Total instances of major production losses (actual number)	18	11	24	18	17	88

Notes: *Industry-wide factors that affected the production performance of FACT include statutory fixing of fertilizer prices by the Central Government (in the 1970s), decontrol of fertilizer prices in India, and import competition (in the 1990s).
Source: FACT annual report, various years.

FACT has been reporting problems due to shortage of electric power from as early as 1953. The electrolytic hydrogen plant in FACT had to be abandoned soon after it was set up in 1959 because of inadequate supplies of power. FACT reported losses in production due to power interruptions and voltage fluctuations in each of the years from 1969-70 to 1980 – a period when Kerala was reportedly "power surplus" and there was no electricity rationing through power cuts in the State.[37] Power disturbances suffered by FACT during this period of time were noticeably higher than power disturbances suffered by industrial units of similar size in other parts of the country.[38]

For many of the major industrial units in Kerala, the cost of power shortages has been particularly high because of the integrated nature of the production processes in these industries. For instance, a study conducted in 1973 on the reliability of power supply in FACT made the following observation:

> Sophisticated plants operating at high pressures and temperatures require at least 12 hours to come back to normal operations after every shutdown [due to power failure]. Besides, frequent power stoppages cause leakages in the high-pressure pipelines

carrying dangerous gases and inflammable liquids, and also reduce the normal life of catalysts and imported machinery.[39]

After 1980, the power supply situation in Kerala has deteriorated and problems of industrial growth arising out of power shortages and interruptions have increased. Kerala has lost out to other Indian States as regards the availability and the cost of electric power. In India, power generation using coal or natural gas as feedstock has expanded substantially in capacity after the late 1970s; this expansion has been particularly fast in certain regions of the country, where different types of feedstock are more easily available. Power-intensive industries find it profitable to operate in locations where power is available plentifully or where captive power plants can be run at relatively low costs because of the easier availability of feedstock. Annual production capacity of the Kerala unit of IAC expanded by a factor of only 0.6, from 8,000 MT in 1943 to 13,000 MT in 2000. According to reports in 2001, the plant had become almost non-viable after power tariffs were raised by 25 per cent in Kerala.[40] During the same period, the annual production capacity of aluminium in India as a whole had expanded by a factor of 79.6, from 8,000 MT to 645,000 MT; and aluminium production units with very large production capacities were built in regions close to bauxite and coal reserves.

(b) Problems of markets for intermediate goods

The expansion of Kerala's major industries -- intermediate goods such as chemicals and basic metals such as aluminium – has been severely constrained by the difficulties in marketing their products. Although Kerala has been producing a range of chemical products such as titanium dioxide, calcium carbide, acetone and phenol, downstream industries consuming these chemical products – such as industries producing paint, plastics, artificial fibers and pharmaceuticals -- have not emerged in Kerala on any large scale even today. Aluminium-based industries are almost non-existent in Kerala.

In the absence of an easily reachable local market, the expansion of chemicals- and also aluminium-producing industries in Kerala had to depend on demand for their products from markets outside the State. This has not been easy because constraints to the growth of these industries in Kerala are then accentuated by the costs and difficulties of transportation. For instance, in the 1960s, J.K. Industries Limited, Calcutta, noted that the disadvantages to establishing an aluminium smelter in Kerala would be "much more than to any other aluminium producer in India." Bauxite or alumina would have to be carried over 1000 miles

from Bihar, and all the finished products would have to be carried back to the consuming centers.[41] Kerala's State Planning Board (1984a) has noted that Kerala is deficient in basic inputs for the chemical industry, that the main markets for chemical products are located away from Kerala, and that this results in higher costs of transport and handling. FACT complained in 1973 that its costs were higher than its competing units only because of the high transportation costs it incurred.[42] So did Steel India Wire Ropes in 1998, whose raw material comes from and whose customers are located in places far away from Kerala.[43]

In addition to the factors discussed above, Kerala's industrialization was also constrained by the mismatch between the kind of industries that have arisen and the natural environment in Kerala. This includes the problem of high densities of population and limited supplies of land for industry in Kerala's different natural regions. Chemicals-producing industrial units in Kerala are geographically concentrated in the Alwaye-Kochi industrial belt. The effluent discharge by these industrial units has caused considerable damages to the water bodies in Kerala. These industrial units have also caused atmospheric pollution, particularly in the Alwaye-Kochi area.[44] Problems of industrial pollution have been issues of public debate in Kerala, thanks to the activism of environmental movements in the State (Thomas, 2003a).

The issues discussed in the foregoing pages have had, predictably, an impact on the scale of operation of major industrial units in Kerala. Today, Kerala's modern industrial structure is characterized by low scales of operation -- at the level of individual plants as well as at the level of whole industry. In Table 7, we compare the production capacities of selected manufactured goods in Kerala and India in the 1950s and 2000. While Kerala was a major producer in India of these manufactured goods in the 1950s, the State's share in total production in India declined drastically by 2000.

Table 7. *Production capacities of selected manufactured goods, Kerala and India, 1950s and 2000 (in 1000 metric tons)*

Manufactured good	1950s			2000		
	Kerala	India	2 as % share of 3	Kerala	India	5 as % share of 6
1	2	3	4	5	6	7
Caustic Soda	6.6[a]	37.1[a]	17.8	66.0[a]	2019.0[d]	3.3
Sulphuric Acid	56.2[b]	189.4[b]	29.7	--	--	--
Calcium Carbide	10.8[c]	20.0[c]	54.0	0.0[a]	150.0[d]	0.0
Nitrogenous Fertilizers	11.0[e]	9.0[f]	100	325.0[a]	11077.8[d]	2.9
Phosphatic Fertilizers	8.0[e]	9.0[f]	88.9	132.0[a]	3760.7[d]	3.5

Sources: [a] Information collected during field visits, 2001 March-April; [b] for June 1952, from De Sousa (1961), p. 112; [c] estimated production capacity for 1960-61 from De Sousa (1961), p. 224; [d] data for 1999-2000 from <www.indiastat.com>; [e] production capacity in 1948 as reported in FACT annual report; [f] production capacity target for First Five-year Plan, from De Sousa (1961), p. 109-112.

WAS THE "INEFFICIENT" OUTCOME INEVITABLE? REFLECTIONS ON ALTERNATIVE PATHS FOR INDUSTRIALIZATION

There is nothing in the argument so far to suggest that, due to historical factors, the course of Kerala's industrialization was predetermined, to result in industrial backwardness. That will be adopting a fatalist view, ignoring the role of contingency and agency, something which the theory of path dependence does not ascribe to. Evidence from various countries suggest that it is possible to overcome "geographical constraints and lousy initial conditions" with good institutions or effective policy measures (Rodrik, 2003, p.12).[45] At different points in time, industrial policies in Kerala could have changed track to follow alternative paths of industrialization, which might have proved more successful in the State.

There existed great possibilities for taking advantage of Kerala's rich natural resources, including a wide range of agricultural products, enormous forest wealth, long coastline, and several inland water bodies. Kerala has had immense opportunities for agro- and food-processing; production activities based on wood, bamboo, and hard fibers like coir; production of herbal and medicinal products, and tourism (an industry that is currently growing at fast rates in the State). Industrial policies in Kerala have not made good use of these opportunities. It may be useful to remember that industrial policies to promote growth of exports based on agricultural products and natural resources have been crucial to the rapid

development of South East Asian countries, particularly Malaysia and Thailand, especially before 1980 (Reinhardt, 2000).

Industrialization of Kerala involved relatively low levels of investment in knowledge-based industries. Industries manufacturing electrical and non-electrical machinery, electronics, and software industries do not have a considerable presence in the State. There are no major research institutions in Kerala carrying out basic or applied research in science or engineering. Compared to its neighboring States, Karnataka and Tamil Nadu, Kerala has much fewer engineering colleges and other institutions for technical education.[46] At the same time, Kerala has a relatively large supply of educated workforce. Skilled laborers from Kerala including medical professionals, and particularly nurses, have been migrating in large numbers to the rest of India and abroad. Effective state intervention in knowledge-based industries, of the kind that occurred in the case of some East Asian countries and also in the case of some regions in India like Bangalore, could have reaped rich dividends in Kerala.[47]

There was considerable expansion of consumer demand and domestic savings in Kerala after the mid-1970s, consequent to the large flow of remittances from migrant workers in Gulf countries. It is of note, however, that there have been no major policy measures in the State to channel domestic savings to productive investment or to take advantage of the expansion in consumer demand for industrial growth. Gulf remittances led to a boom in investments in real estate and house construction in Kerala. In fact, according to Harilal and Joseph (2003), the fast increase in consumption associated with Gulf remittances led to a loss of competitiveness to the tradable, goods-producing sector in the State.

CONCLUSIONS

The relative industrial backwardness of Kerala – the Indian State that has made remarkable achievements in social spheres – has been a puzzling question in development. The popular argument is that Kerala's industrial backwardness is due to labor problems. A recent study showed that while the organization of informal-sector laborers may have led to the loss of competitiveness to the State in industries that are based entirely on cheap labor, labor problems do not explain the slow growth of modern factory sector in Kerala (Thomas,

2003b). This paper explains Kerala's industrial backwardness as due to a path dependent process of industrialization.

A policy decision of the Travancore administration in the 1930 -- to attract large-scale, chemicals-based industries to the State by the advertisement of cheap hydroelectricity as the basis for industrialization – has had a long lasting impact on Kerala's industrial structure. After 1950, State Governments in Kerala continued investments in chemicals-based industries by offering hydro-electric power at highly subsidized rates. However, by the 1980s, Kerala was chronically facing power-shortages, and power rationing and power cuts have crippled large-scale industry in Kerala. Kerala also lost its early advantage over other Indian States with respect to the cost of electric power. There are constraints with respect to marketing of chemicals and allied industrial goods produced in Kerala; downstream industries consuming chemicals or other intermediate goods never did emerge in Kerala on a large scale. There have been popular protests against air and water pollution caused by the chemicals-producing units in the State. All these factors have limited the expansion of the chemicals-dominated, modern industrial sector of Kerala.

The path dependent sequence of events that led to the domineering presence of chemical industry in the factory sector of Kerala is similar to how QWERTY, although not the most efficient keyboard arrangement, came to be accepted as the standard. As QWERTY gained popularity over the 1880s because of "historical accidents", the costs of switching to a more efficient keyboard arrangement – including the costs associated with training users and replacing machines – became prohibitive to the users (David, 1985). Once investments in chemicals-based industries were made in Travancore, it made sense, at least in the short run, for State and Central Governments to continue making investments in chemicals-based industries after 1950, in order to build on the economic linkages for which there was potential. Over the years, the specific problems of a one-pronged, chemical-based industrialization strategy became clearer to governments and to the public in Kerala. However, no attempts were made to reverse or make basic changes to the existing industrial structure.

There are several constraining factors that kept the course of Kerala's industrialization on its former course. First, public investment in industry in Kerala by the Central Government has been low. Secondly, State Governments in Kerala, like State Governments in other Indian

States, have had only limited degrees of freedom in regard to policy options in industrial development, particularly because of the low level of fiscal transfers from the Centre to the States. Thirdly, given the high rates of unemployment in the State, there have been strong pressures from the public to protect employment in the existing industrial units, and this further reduced the options available to democratically elected governments in Kerala.[48] Lastly, an indigenous class of entrepreneurs never emerged in Kerala due to reasons that require further investigation. Savings mobilized in Kerala have been channeled to investments in real estate, house construction, and some service sector establishments.

Of course, altering the course of industrialization was (and still is) possible. It is also true that, given the relatively large supply of skilled labor force, Kerala has great prospects in knowledge-based industries. Charting out a new path for Kerala's industrialization, however, requires much greater investment and policy intervention from the Central and State Governments than what was seen over the past five decades. Industrialization experience of Kerala draws attention to the importance of path dependence in industrialization, and also the importance of sound policies in navigating the economy to the right path.

ENDNOTES

1 Krugman (1991) explains how path dependence leads to concentration of manufacturing activity in some locations. Kenney and Burg (1999) gives an explanation based on path-dependence for the growth of Silicon Valley as the centre for technological innovation. Meyer-Stamer (1998) writes about the role of path dependence in the development of industrial clusters in Brazil.

2 To cite one of the early examples, Veblen (1915) wrote about how the British industrial organization got itself tied to a technology, which, although was the pioneering one, had by then become obsolete: Britain was "paying the penalty for….having shown the way" (Veblen, 1915, pp.129-132).

3 See also North (1990, ch.11), David (1994), and Araujo and Harrison (2002) for discussions on path dependence in economic changes.

4 India's Annual Survey of Industries defines registered factories as factories that employ more than ten workers with the aid of power and more than twenty workers without the aid of power. All registered factories are categorised under the factory sector.

5 Workers refer to the sum of 'main' and 'marginal workers' as defined by the Census of India 2001. Data from Census of India 2001 (<http://www.censusindia.net>) and Annual Survey of Industries 1999-2000, volume I.

[6] Refer to 'principal status' unemployment rates. See National Sample Survey (NSS) (2001) Tables 7.3.1, 7.4.1 and 7.5.1.

[7] All growth rates reported in this paragraph and the next are calculated using semi-logarithmic regression.

[8] The theoretical discussion in the writings of Nicholas Kaldor, W. E. G. Salter and Gunnar Myrdal, and the recent extensions of their work show how differences in realisation of potential economies of scale and technical progress can cause cumulative cycle of regional differences in industrial growth (see Thomas, 2003c).

[9] See Rajan (1987), pp. 121-30 and p.561.

[10] K.George, "Budget Speech", dated 01-08-1924, Travancore Legislative Council Proceedings (TLCP), vol. V, 1925, p.741 quoted in Isaac and Tharakan (1986), p. 17.

[11] According to Bagchi (1972, pp. 188-91), the whole of south India lagged behind Bombay and Bengal in development of large industrial establishments until 1914.

[12] See Gadgil (1924), pp. 201-2 on this.

[13] See Peter (1952), ch.9.

[14] Pillai (1940), vol.III, ch.21, pp. 498-504.

[15] Bright Singh (1944), pp. 476-83.

[16] According to K.S. Joseph, while opposing the demand for financial grant for electricity at the Sri Chitra State Council (SCSC), Third Council, First Session, dated 06-09-1944 (see SCSC, Vol.24, No.4, p.191 cited in Rammohan, 1996, ch.4 p. 209).

[17] Of the total connected load of 70,129 KW in 1953-54, a load of 17,976 KW (or 25.6 per cent of the total load) was allocated to IAC. A few large industrial units including the aluminium smelter, together, accounted for 59 per cent of the total connected load, leaving only the rest to the numerous oil mills, coir factories, textile factories, etc. in the State (see Government of Travancore-Cochin, 1956, p. 4-5).

[18] See Ray (1979), pp. 183-92. Also see Rammohan (1996), ch.4, p.209, ff.201.

[19] See also Bagchi (1972, p. 437), Gadgil (1924, pp. 295-97), and Morris (1983, pp. 637-8) on the beginnings of chemical industry in India.

[20] The entire list of raw material, along with their locations of availability and industrial uses, required for the development of chemical industry in India is given in AIMO (1945), pp. 22-25.

[21] See Proceedings of the Kerala Legislative Assembly, various years.

[22] See Budget Speeches to Kerala Legislative Assembly, various years, and the data cited in Thomas (2003a, ch.3)

[23] Data obtained from Kerala State Industrial Development Corporation.

[24] Speech by Finance Minister, C. Achutha Menon, while presenting the budget for the year 1959-60 (see Budget Speeches to Kerala Legislative Assembly, various years).

[25] Letter from K. R. K. Menon, Chairman of KSIDC, to the Industries Department, Government of Kerala, dated 14-08-1965 (see (Kerala State) Industries Department Government Order Number (G. O. No.) Ms 559, dated 16-08-1965).

[26] The State Government agreed to supply 12.5 MW of power to IAC by the middle of 1963 (for the proposed expansion programme of IAC) at a tariff rate of Rs.130 per KW per year, although KSEB had indicated that the Board's cost of production would not be met at any rate lower than Rs.140 per KW per year. Later, the licensing committee of the Government of India questioned the low rates charged to IAC; KSEB clarified to the committee that it had not offered any subsidy to IAC, and that the low rates charged had been part of the State Government's policy for attracting industries to the State (see Industries Department G. O. No. Ms 185, dated 15-03-1961).

[27] See NCAER (1969), p. 83.

[28] See the letter from Cominco Binani Zinc Limited to the Industries Department, Government of Kerala on 3-12-1963 (Industries Department G. O. No. Ms 274, dated 9-04-1964).

[29] See KSEB (2000), p.37, Table 28.

[30] Similarly, Kerala could sell its rubber-based industrial products to automobile manufacturing units in Tamil Nadu. However, rubber-based industrial units in Kerala are, mostly, small-scale units, and the State has only two major tyre-manufacturing units (Thomas, 2003a).

[31] In 1995-98, Kerala, Maharashtra, Gujarat, and Tamil Nadu, respectively, account for shares of 2.3 per cent, 31.3 per cent, 29.0 per cent, and 5.7 per cent in total gross value added by India's chemical industry. The shares give an idea of the size of chemical industry in the four States (based on data from Annual Survey of Industries).

[32] This was pointed out in a note made by the Managing Director of TCC after his visit to New Delhi in connection with TCC's license application for the company's third stage expansion (see Industries Department G. O. No. Ms. 315, dated 25-04-1961).

[33] In a letter dated 13-12-1960 from Manubhai Shah, Union Minister for Industries, to K.A.Damodara Menon, Minister for Industries, Government of Kerala (see Industries Department G. O. No. Ms. 357, dated 16-05-1961).

[34] TCC had applied for a license in September 1960 to expand production capacity of its caustic soda plant from 50 tons per day to 100 tons per day (as part of the 3rd stage expansion of the company). The company indicated that it could sell its products in Kerala and neighbouring States; of the 16,500 tons of caustic soda it would annually produce, Gwalior Rayons plant would consume 3200 tons and Travancore Rayons would consume 1650 tons (see Industries Department G.O. No. Ms. 357, dated 16-05-1961; and Industries Department G.O. No. Ms. 294, dated 7-11-1973 for details on consumption of caustic soda and chlorine by industrial units in Kerala).

[35] See Industries Department G.O. No. Ms. 521, dated 31-12-1968.

[36] See <www.indiastat.com> dated 30-01-2004.

[37] See FACT Annual Report, various years.

[38] In the year 1969-70, there were a total of 102 power disturbances (interruptions and voltage drops) in FACT compared to 18 in Fertiliser Corporation of India (FCI) Nangal, 6 in FCI Trombay, 12 in Gujarat Fertilizer Company, and 31 in Madras Aluminium Company (see Industries Department, G.O. No. Ms. 174, dated 15-06-1973).

[39] From the study on the reliability of power supply in FACT (see Industries Department, G.O. No. Ms. 174, dated 15-06-1973).

[40] See <http://www.indiainfoline.com/comp/inal/me447.html> dated 30-10-2001.

[41] See Industries Department G.O.No. Ms. 559, dated 18-12-1965. According to J.K. Industries Limited, the only advantage of locating the aluminium plant in Kerala was the availability of electricity at cheap rates in the State (see Industries Department G. O. No. Ms 752, dated 22-12-1964).

[42] See Industries Department G.O. No. Ms.174, dated 15-06-1973.

[43] See Industries Department G.O.No. Ms 118/98/ID, dated 25-08-1998.

[44] It is of note that in August 2004, the State Pollution Control Board in Kerala issued closure notices to 198 industrial units in the State for flouting pollution control norms.

[45] Institutional frameworks that trigger economic growth can, of course, differ across regions and countries. Casper and Whitley (2002) show how, across the various European countries, fast growth in high-technology industries was generated by markedly different institutional structures.

[46] Actual number of engineering colleges and number of engineering colleges as a proportion of the State's population in Kerala have always been lower than the corresponding numbers and proportions in Karnataka, Tamil Nadu and Andhra Pradesh (see <www.indiastat.com> for details).

[47] It is argued, for instance, that government intervention in setting up high technology industries and, more importantly, in education and research was the key to Taiwan's success in high technology industries and services (Amsden and Chu, 2003).

[48] A good example is the case of Grasim Industries in Mavoor in Kerala, which was finally closed in July 2001. There were public agitations for several years against the pollution caused by this industrial unit. At the same time, in periods when the factory had been closed earlier, there was also wide popular demand led by groups of retrenched workers to reopen the industrial unit.

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