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# The Asian Electronics Industry Looks to the Future

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*Jeremy Clarke and Vincent Cable*

## Introduction<sup>1</sup>

In recent years the electronics industry has become a considerable focus of attention for Third World policy-makers because of its apparent success in generating substantial employment and growth opportunities in a limited number of Asian and Latin American newly industrialising countries (NICs). It is the potential for imitating the successful experience of these countries that has attracted much interest and considerable policy effort by a group of poorer developing countries in South and South East Asia. These countries have attempted to foster an electronics industry by attracting foreign investment for the manufacture of components and assembly of consumer appliances, by encouraging the transfer of technology and by building up domestic infrastructure and skilled manpower.

However, it is clear that the circumstances in which these countries have embarked upon this road are significantly different, in that policy-makers in the industrialised countries are becoming increasingly sensitive to increased import penetration both from Japan and from less developed Asian countries [Cable and Clarke 1981]. In Britain, quota action has been used against Taiwan and South Korea to obtain 'voluntary export restraints', and Thailand is the latest country to be faced with restrictions (in black and white TVs).

The main aim of this article is to assess likely future developments both for the more advanced NICs and for the group of poorer Asian developing countries. One essential (though difficult) component of any 'future-gazing' in this industry is the need to assess the likely impact of future technological change. The most significant problem facing the more advanced NICs (especially South Korea and Taiwan) in this area is the extent to which they will be able to improve productivity and product quality through the

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<sup>1</sup>In this article the 'Asian electronics industry' is taken to include South Korea, Taiwan, Hong Kong, Philippines, Singapore, Indonesia, Malaysia, Thailand and Sri Lanka. The larger economies such as China and India, which have adopted different development strategies for their electronics industry than that typically adopted in the countries named above, are excluded.

introduction of automation, both in the production of components and in the assembly of consumer items. Whether these countries are capable of achieving such targets will largely determine whether they can reverse the emerging trend by which industrialised countries have attempted to forestall the otherwise predictable drift of production capacity to ldc, by encouraging similar technological improvements in their own firms.

## The character of the Asian industry

As Table 1 shows, the four South East Asian NICs (South Korea, Taiwan, Hong Kong and Singapore) continue to dominate exports of electronic products from all developing countries, accounting for nearly 80 per cent of all exports in 1978. Moreover, this dominance is growing, despite substantially increased exports from Mexico and Brazil during the 1970s and the extremely rapid growth displayed by newcomers such as the Philippines, Malaysia and Thailand. In fact sustained high growth by the four NICs has meant that their share of ldc electronic exports has increased from 60 per cent to 80 per cent during the years 1967-78.

The most obvious explanation for the spectacular performance of the NICs is the comparative success of a development strategy based upon the attraction of foreign direct investment by mainly US and Japanese multinational electronic companies in the components and consumer appliance industries. These companies were originally attracted by the lure of low labour cost production sites (particularly in South Korea and Taiwan) as well as a generous range of investment incentives.

In strong contrast, most South American countries (eg Brazil and Argentina) and India were less concerned to boost exports of consumer products than to establish a more selfreliant and broadly based electrical engineering industry. The industries of these countries have instead been characterised by restrictions on foreign ownership and the free flow of imported inputs [UNCTAD 1978]. The Asian industries owe much of their present character to the form MNC involvement has taken. Initial investments during the

table 1

**Growth of exports of electrical machinery from developing countries (SITC 72)**  
(US \$ mn)

	1967	1973	1976	1978	average annual growth 1967-73 %	output growth 1976-78 %
1) Singapore	18.5	387.8	885.2	1568.4	66	77.2
2) Taiwan	38.6	741.8	1194.7	1487.0*	64	24.5
3) Korea	7.4	312.5	805.6	1252.2	87	55.4
4) Hong Kong	108.9	583.7	990.8	1228.9	32	24.0
5) Mexico <sup>a</sup>	13.6 <sup>a</sup>	(410.5)	(723.6)	na	76	na
6) Malaysia	2.4	11.3	206.4	524.7	29	155.45
7) Yugoslavia	80.8	240.5	351.6	417.0*	20	18.6
8) Brazil	5.4	87.1	202.7	346.5	59	70.9
9) India	na	31.4	85.3	102.7	—	20.4
10) Thailand	0.4	1.8	48.0	64.8*	29	35.0
11) Argentina	2.9	32.9	37.0	47.4*	50	28.1
12) Indonesia	—	—	31.6	32.6*	—	3.2
13) Philippines	—	2.2**	6.4	25.9	—	304.7
total	285.7	2873.7	5653.2	7200.8	—	27.5
(1-4) as % of total	60.7	70.5	68.6	76.9	—	—

Source: *UN Yearbook of International Trade Statistics, 1978* and P. Plesch, 'Developing countries' exports of electronics and electrical engineering products', *World Bank Working Draft*, table 5.

Notes: \* 1977 \*\* 1974

<sup>a</sup>Mexican exports have been modified to reflect border assembly industries. Figures in brackets are estimates.

1960s and early 1970s took the form of direct investment and wholly owned subsidiaries producing for the world market. Two types of product and activity dominated. The first was the assembly of imported components into consumer appliances such as radios, tape recorders and, later, monochrome and colour television. Major investments were made by American companies such as RCA in South Korea, Taiwan and Singapore for the assembly of colour TVs for the US market. This lead was soon followed in the early 1970s by the Japanese MNCs, who invested in order to create major production bases in South East Asia for export and to avoid the threat of rising protectionism facing Japanese sourced products in major industrialised country markets.

A similar pattern emerged in the component industry, particularly following the mass production by American companies of integrated circuits in the early 1970s. Companies such as Texas Instruments and National Semiconductor were anxious to take advantage of the low labour costs in those parts of the production process for semiconductors (assembly, testing and packing) which were labour intensive. Despite the highly dependent form of such specialisation, investments in the component industry have never-

theless been largely responsible for the growth of employment and exports in Malaysia and the Philippines.

However, there were important technological differences between these two branches of the industry which have considerably affected the type of ownership and degree of involvement with foreign companies. In the consumer electronics sector there is a range of products (portable radios, tape recorders and black and white TVs) in which product design has become fairly standardised, and as a result technological change through product and process innovation has become incremental rather than fundamental. It has therefore been possible for nationally owned producers to emerge first in the NICs and now in a wider group of Asian countries. This has usually occurred with active participation by the MNCs whether through joint ventures (as in South Korea) or licensing (including Original Equipment Manufacturers (OEM) arrangements in which exports are marketed under the brand name of a Western manufacturer). There is evidence also of a gradual building up of domestic sources of supply for the major components required by the assembly industry.

The process has gone furthest in South Korea, Hong Kong and Taiwan with the emergence of large indigenous producers of consumer electronic appliances such as Samsung, Goldstar, Tatung, Radofin and Timco. Most of these started manufacturing under licence to MNCs, but increasingly the majority of their earnings come from products of their own design sold under their own brand names both in the Asian region and in Western countries through independent importers or direct to retail stores. The larger Korean firms such as Samsung now provide nearly all of their component requirements from domestic sources, including the more technologically advanced components such as semiconductors and colour cathode ray tubes. The largest firms have substantial R and D departments.

These are exceptional, however, and most producers even of the standardised items have links with MNCs, especially the Japanese. The role of the Japanese companies in providing technological know-how to the NICs has been somewhat ambivalent, since although they were apparently willing to assist the development of standardised or 'mature technology' products such as simple audio equipment and monochrome TVs, for commercial reasons they have tended to keep a much tighter control of technical know-how in more advanced products and processes where technology has been changing more rapidly. It has also been claimed that Japanese producers of essential components such as colour cathode ray tubes have even in some instances withheld supplies in order to provide a commercial advantage to those NIC firms with technical co-operation agreements with the Japanese. The pattern of Japanese involvement in Asia has therefore been mainly to build up production of standardised technology products. However, apart from the largest South Korean and Taiwan firms, the price of reliance on Japanese companies for know-how in consumer electronics has been a heavy dependence on Japanese sourced component supplies:

Asian nations are now established as the supply base of consumer electronic appliances for the world . . . they are nevertheless heavily dependent upon Japan for supplies of integrated circuits, precision component parts and colour TV components. They import more than 70 per cent of their needs from Japan.

*{Journal of the Asian Electronics Union (JAEU),  
July 1981}.*

Despite the successes of the South Korean and Taiwan industries and the introduction of restrictions on foreign investment in recent years, it is clear also from Table 2 that foreign involvement is still substantial in these countries, at around 45-50 per cent of total production. Levels of foreign ownership are even higher in the

second ranking group of Asian producers, with levels of over 90 per cent being the norm. The same is true of Singapore, where over 80 per cent of production is by wholly owned subsidiaries of MNCs (mainly Japanese but now also European).

Dependence on MNCs is even higher in the case of technology intensive components such as integrated circuits and microprocessors, where the product life cycle is short and rates of innovation high. In general it has been extremely difficult for Asian countries to develop a domestic production capability in this sector, partly through lack of know-how but also due to high rates of innovation which render such components obsolete within a short space of time. Nevertheless, there are examples amongst the advanced NICs where locally owned firms have emerged or additional foreign investment made as a result of linkages to MNC component makers. Moreover, as some Hong Kong firms have shown, assembling advanced technology components can have its benefits, since locally available components can be used to design brand new products. For example, Hong Kong's recent 'miniboom' in the production of hand held electronic games was largely the result of the fact that in 1977 several US firms set up offshore processing facilities for the construction of microprocessors which were assembled from kits imported from the USA. At first many of the locally owned firms such as Radofin worked on a sub-contracting basis, but they soon diversified into other product areas using the available supply of microprocessors to produce a host of advanced technology products, including electronic watches, printing calculators, teletext adaptors, viewdata receivers and video games. Firms such as Radofin have shown a considerable capacity to combine locally available components with in-house design skills and sub-contracting deals which have given access to technically advanced products. The company has in fact recently developed its own viewdata receiver manufactured to British Telecom standards and capable of converting any PAL<sup>2</sup> TV set into a viewdata terminal, at a price below most of its competitors. Other Hong Kong firms have been designing and making automatic language translators and producing some of the latest products such as programmable calculators.

### **Future prospects for electronics in Asian Idcs**

The future development of electronics in Asian Idcs depends partly on internal factors and national policies but, as we have noted, the industry is still so heavily export orientated and dependent upon foreign capital that much also depends on external factors over which governments may have little control. Enough

<sup>2</sup>PAL (Phased Alternating Line) is the main transmission system operating in Europe.

table 2

**Characteristics of the Asian electronics industry c. 1980**

<i>country</i>	<i>pro- duction (\$ mn)</i>	<i>composition</i>	<i>dependence on exports (exports/ production %)</i>	<i>dependence on exports (exports/ production %)</i>	<i>number of workers '000</i>	<i>dependence on foreign investment</i>	<i>stage of development</i>
South Korea	3,300	consumer appliances industrial appliances components	40 10 50	70	180	25% (50% including joint ventures)	export base for consumer electronic appliances and components
Taiwan	3,200	consumer appliances industrial appliances components	45 6 49	80	230	45% (including joint ventures)	export base for consumer electronic appliances and component parts
Hong Kong	2,000	consumer appliances industrial appliances components	68 2 30	more than 90	90	approx. 10%	export base for low-to-medium priced consumer electronic appliances
Philippines	320	65% components otherwise mostly for consumer appliances		90	34	extremely high	export base for components, and assembly base for electronic appliance for local market
Singapore	1,850	consumer appliances industrial appliances components	39 2 59	90	66	extremely high (more than 80% of total production)	export base for consumer electronic appliances (dependence on imported components more than Korea and Taiwan)
Indonesia	541	more than 90% for consumer appliances		2	43	high (foreign investment is restricted to some areas but most producers are receiving technical assistance)	assembly base for electronic appliances for local market

*continued*

table 2 continued

country	production (\$ mn)	composition	dependence on exports (exports/production %)	number of workers '000	dependence on foreign investment	stage of development
Malaysia	990	90% components	75	61	extremely high (more than 90% of the total production)	export base for low-to-medium consumer electronic appliances and some components
Thailand	106	90% consumer appliances	10	40	extremely high	assembly base for electronic appliances for local market
Sri Lanka	little	small production of radios	—	na	low	assembly base for some electronic appliances for local market

Source: *Journal of the Asian Electronics Union*

has already been said to indicate that the Asian industry can be usefully divided into two distinct categories (excluding the large and more self contained economies of India and China). The four NICs represent one group in which sizeable national firms have emerged in an industry which has proceeded some way toward technological independence and high local sourcing levels in at least some products. The second group is composed of a growing number of technological 'followers' including Malaysia, Thailand, Indonesia, Philippines and now Sri Lanka. As Table 2 shows, this group of 'followers' is characterised by a very high degree of dependence on foreign investment, and where exports are significant (eg Malaysia and the Philippines) they are mostly of components such as integrated circuits and other semiconductors.

### The 'followers'

All of these countries are still at the stage of assembling consumer appliances from imported components predominantly for the domestic market, but they have reached different stages in the process of building up local content levels. Moreover, some of these countries have also established a significant export trade in the component sector.

Malaysia, and to a lesser extent the Philippines, have managed to build up substantial employment levels of

61,000 and 34,000 respectively by concentrating upon the export of integrated circuits which for the most part have been produced by MNC subsidiaries in Free Trade Zones with few linkages to the domestic economy. The concentration on increased exports and employment is also noticeable in the consumer appliance sector in the emphasis on production of simpler technology products such as radios and radio cassette recorders, whereas TV production is negligible.

Indonesian development has largely been confined to the production of consumer appliances for the home market, but there is an emerging export surplus of more advanced products such as monochrome and colour TVs. Thailand is also starting to export consumer appliances, including TVs, from an industry hitherto based on home demand. The Thai industry has, moreover, been growing rapidly, but dependence on imported components remains high (it is estimated that only about 10 per cent of value is added locally). Nevertheless the scope for domestic entrepreneurship seems wide and there are currently seven large-scale radio and TV factories, 20 small-scale assemblers and a growing 'cottage industry'—radio repair shops and wholesalers who assemble and market copies of popular models. It is claimed that nearly a third of domestically owned radio sets are purchased in this way.

A common aim of many of the governments of these countries is to promote the expansion of the consumer appliance sector because of the scope for gradually increasing the share of components coming from nationally owned producers, whilst at the same time maximising the technological spin-offs from foreign capital investment. For example, in Thailand,

the government through the Board of Investment has placed the electronics industry on its priority list for production privileges because it recognises that the industry is export orientated, labour intensive, uses advanced technologies and provides linkages with a wide range of other activities.

[JAEU, February 1981]

The Philippine Government in particular has also embarked on a large-scale education programme designed to provide specific engineering skills to the growing industry. However, the building up of the consumer appliance sector in these countries remains highly dependent on Japanese firms, most notably in the more technologically advanced products such as TVs and music centres.

## The four NICs

Governments of the four Asian NIC producers have several interrelated objectives for the future of the electronics industry; to achieve higher value added, improved quality and more diversity in their product range; to reduce labour intensity in the production process (because of emerging labour shortage); to develop a capacity to produce the latest and most sophisticated products and to carry out a greater degree of R and D domestically. Clearly the extent of government involvement will vary considerably from the more 'organised' and 'dirigiste' approach of South Korea to the more entrepreneurial style of Hong Kong, with the other two countries somewhere between these extremes. Korean firms (with government backing) plan ahead and then embark on large-scale production of relatively new but well defined product areas, with as much local technological and material content as possible. Hong Kong's flexible and adaptive businessmen, on the other hand, have been more successful in anticipating and responding to shifts in fashion, but have been less concerned to build up the supporting infrastructure and linkages for large-scale



Information Service, Taiwan Authorities

Examination of electronic components.

industrial production ('speculators rather than investors' as they have been described).

Based on their past performance, the capacity of the NICs to achieve their objectives is likely to be varied. In fact, South Korea and Taiwan have gone furthest towards formalising and achieving their stated objectives. In the past, priority has been given to reducing dependence on imported components which are often in short supply (and may be deliberately withheld in some cases) and at the same time to reduce their role as exporters of specialist semiconductors. In the consumer appliance sector South Korea and Taiwan now provide nearly all of their component requirements from local sources (Korea now has 85 per cent local components in its colour TVs). Even components such as semiconductors and colour cathode ray tubes, which were until recently imported exclusively from Japan, are now being produced by large indigenous firms like Samsung and Tatung. Korea has also managed to reduce its dependence on components by cutting the share of these products in the total value of electronics exports from over 80 per cent in 1970 to well under 50 per cent. Less organised Hong Kong remains more dependent, and manufacturers of consumer appliances typically import around 60 per cent of their component needs.

The future objectives of the NICs are reflected in the forward plans and policy statements made by their governments. For example, South Korea has recently announced a 'Basic Plan for Promotion of the Electronics Industry'. According to the Chairman of the Korean Electronics Association the main aim is to 'foster development efforts in order to achieve the automation of production facilities, the improvement of product quality and the development of new products' [*JAEU*, July 1981]. The Plan calls for the rationalisation of existing production facilities for consumer appliances such as TV and audio equipment and for the establishment of domestic production of video cassette recorders (VCRs) and video discs. In tandem with this it is recognised that product quality must also be improved, and the latest technical advances are taken account of in a whole range of consumer appliance components, including coloured cathode ray tubes, silicon wafers, liquid crystal displays and high density printed circuit boards. The Koreans have also placed particular emphasis on the development of more advanced technology products including semiconductors, computers, computer peripheral and terminal apparatus, and the development of Very Large Scale Integration (VLSI).

A similar approach has been adopted by the Taiwan government, which is also attempting to promote technology intensive operations by providing

government assistance for R and D. This is designed to improve production techniques, to develop new products and to provide quality testing equipment.

Even in Hong Kong, whose authorities have been less actively involved, it is officially recognised that there should be an effort to increase product and process innovation, and efforts are being made to 'concentrate on skill and technology intensive operations and to pay more attention to manpower training and the provision of adequate support facilities' [Hong Kong Government 1979:13]. The Hong Kong authorities have also encouraged businessmen to diversify into technologically advanced sectors such as micro-processor-based industrial control equipment, data processing and peripherals, and microcomputers, as well as a new generation of components (large-scale integrated circuits, high reliability printed circuit boards, connectors and interconnection systems).

The objectives of the NICs suggest that in the future they are aiming to combine the advantage of relatively low labour costs with more advanced technology in the production of consumer appliances and components. In the range of existing products this implies 'capital deepening' technical innovation involving in this case the increased use of automated machinery in the production process. In the consumer appliance sector it is in the production of colour TVs that the major technical advances have been made, so far mostly by Japanese firms. The introduction of automatic insertion equipment in this sector is also linked to improvements in product design which have tended to reduce the number of components per set.

If NIC firms were able to adopt the best Japanese practices this would tend to reduce the labour component in set production and encourage the adoption of more capital-intensive automated production techniques which would simultaneously improve product quality and overall cost competitiveness. In this way they would keep one step ahead of both Japanese exporters and industrialised countries like Britain, which are trying to stay in the colour TV business by adopting Japanese production techniques.

However, despite the success of large NIC firms in recent years, their ability to carry out such far-reaching reforms from their own resources is likely to be limited. Most of the larger Asian companies have their own R and D divisions, but their capabilities and the extent of these resources should not be overstated. For example, in terms of product and process technology it has been claimed that South Korea is trailing 15 years behind Japan, and the gap may be widening, since R and D expenditure of Korean firms is put at only 1.3 per cent of sales revenue, a third of Japanese levels [*Economist*, 6 September 1980:68].

The achievement of government objectives in this sector seems to imply the necessity to forge technical cooperation deals with the most advanced (Japanese) firms (both consumer appliance and machine makers). In Korea it is hoped that this can be done by acquiring licences involving the payment of royalties which generally range from three to four per cent (but may be as high as 10 per cent) of the product selling price.

Although these policies have proved successful in more standardised areas of product and process technology, it is apparent that Japanese firms (even in the case of joint ventures) have displayed a reluctance to sell licences for more advanced technology. As Scibberas [1979] has pointed out, Japanese firms prefer to transfer know-how only for 'simple products such as black and white sets and simple colour portables, using older technology in tubes and semiconductors'. The same is apparently true of innovations in process technology since 'with the exception of subsidiaries of some Japanese firms all assembly in the developing countries was done manually'. Japanese producers have also been unwilling to provide Korean firms with technical know-how for new products such as VCRs and video discs.

Nevertheless, despite the apparent reticence of Japanese firms to provide advanced technical expertise, another source may be European consumer electronic firms which are showing increased interest in NIC production sites as they undergo considerable restructuring in the face of severe Japanese competition. For example, Philips has recently declared:

we would like to be able to close some of these (European colour TV plants) and concentrate production in one or two locations and if need be move production to cheap locations offshore (eg in the Far East).

[*Economist*, 28 June 1980]

In fact, the expansion of colour TV exports to Europe by Asian countries has been severely restricted in the past by the PAL system of patents which effectively prevented non-licensees from exporting larger screen sizes to Europe.<sup>3</sup>

However, the protective effect of the licensing system will decline as the licences begin to expire in 1982-83 and as more companies are granted licences. As yet only Japan and Singapore-based manufacturers have

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<sup>3</sup>Companies wishing to produce sets for markets in the PAL system (ie Europe) are required to take out licences from the West German manufacturer, Telefunken. Eleven Japanese companies and some Singapore and Hong Kong based manufacturers have been granted the licence, but Korean and Taiwan firms have been excluded. However, Telefunken's main licence expired in 1980 and the rest of the PAL patents begin to expire in 1983.

been licensed, but South Korean, Taiwan and now Thai firms are all currently negotiating on royalties and licensing. In fact, European firms seem to be increasingly willing to enter into technical assistance agreements with NIC firms and in some cases to engage in foreign direct investment. For example, Philips already has a portable colour TV factory in Singapore operating within the PAL licence system and as a result there has been a rapid export expansion to Europe (Singapore provided 12 per cent of all UK colour TV imports in 1979).

Thomson-Brandt also operates a wholly owned subsidiary in Singapore (European Standard Electronics) producing portables to PAL specifications. AEG/Telefunken has recently reached an agreement to produce colour TVs in Hong Kong for export to Europe, and had previously entered a technical assistance agreement with the Singapore firm 'Roxy Electric', which now produce colour portables to PAL specifications.

This increased involvement of European firms is likely to lead to improvements in local standards of product design and production technology, but it is increasingly apparent that NIC quality and design standards have been improving anyway. This has occurred in South Korea, where 'established makers of CTVs have plans to upgrade their product lines . . . by introducing new models with high end features', and in Singapore, where new models have fewer components and increasingly sophisticated optional features such as sensor touch switches, remote control devices and stereo sound [*Asian Sources, Electronics*, November 1980:10].

Over and above the difficulties involved in obtaining satisfactory collaboration with Japanese TV firms, there is an additional problem presented by the predominance of Japanese firms in the production of automatic insertion equipment (Matsushita Electric Industrial company is the main supplier in this field). Nevertheless, Universal of the USA is also a major producer and may be more willing to set up licensing agreements. Some machine makers have in fact experienced increased sales both to Europe and South East Asia (South Korea and Taiwan) [*JAEU*, July 1981].

There are also signs that at least in some South East Asian subsidiaries of major Japanese manufacturers the level of automation is increasing, where it is justified by sufficiently high plant volumes. For example, Hitachi Singapore (whose main markets are the USA, the UK and China) have embarked on an ambitious plan to double the level of CTV production to over 300,000 units per annum using computer controlled automatic circuit board assembly systems and component sequencing equipment.



The NICs also have ambitions to diversify their electronics industry into the production of advanced technology components, into new product areas such as computers and new branches such as industrial electronic testing equipment. It is possible to point to some successes in this sphere. For example, some Hong Kong firms are said to be capable of designing and producing sub-systems for computers, and some manufacturers have also demonstrated the capacity to design circuitries for sub-assembly components, to meet the requirements of overseas buyers. It is also apparent that the NICs have been moderately successful in building up backward linkages in the production of some of the more standardised integrated circuits (ICs). These have included crystal growing and circuit design, but also the production of connectors and interconnectors which are key components in microprocessors. There are at present only six plants in the world producing connectors and interconnectors, and the latest is being built by Dupont in Singapore. Other advances have been made by the major NIC consumer appliance manufacturers (eg Samsung), who produce nearly all of their semiconductor requirements in-house. A Hong Kong firm, Micro Electronics Ltd, is currently making silicon wafers for local production of integrated circuits, and two Taiwan firms are also making standardised ICs for use as memory chips in a wide variety of local consumer good applications.

Nevertheless, there are serious constraints on further advances in an area where technological change is so rapid and the R and D commitment by individual firms needs to be so great. This is likely to make future developments heavily dependent upon foreign investment and technical link-ups with leading firms. In fact, major progress still needs to be made in the development of an indigenous production capacity, even in standardised integrated circuits, and what has been said of the Hong Kong industry is generally true of the NICs as a whole:

very few local companies are capable of producing these items [integrated circuits] from the basic material, silicon wafers, and most companies import completed wafers and perform assembly and preliminary testing operations.

[Hong Kong Government 1979:10]

### **Future growth**

Predictions of future developments in production and trade in electronics are far more speculative than in other product areas. Since Asian exports are heavily orientated towards the markets of the industrialised countries, the level of exports is generally highly sensitive to the level of overall demand in these markets. The nature and impact of technological innovation is also difficult to predict, as are the strategic interests of MNCs.

Nevertheless, we shall briefly examine three of the most significant determinants of future growth in this industry and in this range of products; the level of domestic consumption, the international trading environment and the effects of technological change.

Regarding the last of these, it is apparent that technological advances made in products such as colour TVs have made it possible for the industrialised countries to contemplate the possibility of halting or even reversing the previous trend towards increased ldc production in the consumer appliance sector.

By increasing the skill component and capital intensity in production of colour TVs these developments will clearly make it more difficult for the NICs and the 'followers' to compete because their comparative advantage still lies mainly in the production of electronic products of standard design and in labour intensive assembly operations. This obstacle is particularly large in the case of the 'followers', such as Thailand and Indonesia, who are attempting to 'trade up' into the production of colour TVs and other more advanced products. The NICs are likely to be less affected by these developments, provided that they are able to improve product design and quality and are capable of adopting 'best practice' (Japanese) production techniques. The product and process innovations that have been made by Japanese firms have significantly raised productivity levels as well as markedly improving product quality and reliability.

Until recently these technical advances had been mainly confined to Japanese firms, but it is increasingly apparent that European companies are attempting to emulate them. A measure of the technological lead of the Japanese companies is that in 1978 Japanese consumer appliance firms had an average of 70-80 per cent of all components automatically inserted in the production of colour TVs, compared to as little as 15-30 per cent in Europe and as yet negligible amounts in South Korea and Taiwan. Earlier research indicated that European countries are keen to restructure their domestic consumer appliance industries both by encouraging indigenous companies to upgrade products and automate the production process, but also (as in Britain, for example) by encouraging foreign direct investment by Japanese MNCs. The same is also true of component production where product quality and levels of automation are increasing in industrialised country plants.

The strategies of the Japanese companies are the main unpredictable element because the adoption of 'best practice techniques', either by the NICs or by industrialised countries such as the UK, is likely to be dependent upon their capacity to attract foreign direct investment and technical cooperation from these firms.

Unfortunately for the NICs Japanese firms seem to be increasingly turning their attention to the industrialised countries:

in the past, Japanese producers directed their attention to Asian countries as a place for overseas production but there is now a move to divert investment to developed countries in North America and Europe . . . no substantial expansion beyond the current fairly active situation is expected from Asian countries as production bases.

[*JAEU*, July 1981]

One of the main reasons for this re-direction of footloose foreign investment from ldc production sites is increased protectionism in industrial country markets. This threat seems to have affected a number of investment decisions by Japanese companies but the same is increasingly true of the major Korean and Taiwan firms. For example, the Korean firm 'Gold Star' recently opened up a plant at Alabama, USA and other Korean manufacturers—Samsung and Taihan Electric Company—are contemplating producing colour TVs in Europe and the USA respectively. The Taiwan firm, Tatung, has recently acquired the Racal/Decca plant which was closing in the UK, and it now plans to produce monochrome and colour TVs for the European market.

Increased protection in industrialised countries also has a more direct effect by restricting demand from the industrialised countries for electronics products produced in Asia. Current restrictions take the form of non-tariff barriers (eg voluntary export restraints in the UK, orderly market arrangements in the USA) which enforce quotas, mainly against the NICs at present but increasingly also against other Asian producers. However, as they stand, restrictions mainly cover more technologically sophisticated products such as colour TVs and music centres, although in the case of the UK black and white TVs are also restricted. This is because pressure for protection is weaker in technologically simpler products like radios and tape recorders, production of which has almost disappeared from many industrialised countries, and whose former producers now have an interest in subcontracting or importing arrangements with ldc. Although this seems to augur well for the 'followers', the advantage of relatively unrestricted market access has to be weighed against the fact that many of these products are in what has been called the 'mature phase' of the product cycle and face a relatively slow (or even declining) rate of growth of market demand.

The future of the Asian industry is also dependent upon increased demand in the home market, and market forecasts show that this will be a significant source of growth for some countries. Now that Korean

firms have been freed to produce colour TVs for the local market, it is clear that domestic demand will form an important source of future growth. Most of the group of followers are predicted to experience growth in home demand, and in most cases this will be met by increased domestic levels of production. The growth of domestic production in this group is in part due to the increased willingness of NIC-based firms with interests in South East Asia not only to subcontract the labour intensive assembly phase of the production process, but also to engage in technical assistance agreements designed to build up local manufacturing capability and the level of domestically sourced components. Taiwan firms are particularly active in this way, and companies like Shinlee are involved in exporting monochrome TV manufacturing know-how, as well as key parts and components in the form of Semi-Knocked Down (SKD) or Completely Knocked Down (CKD) shipments to overseas factories in Thailand and Indonesia. Another company, Elan, has recently begun CKD shipments to Indonesia (for local sales and re-export) and also to India for the local market. The explanation of this trend seems to be that NIC companies wish to secure production bases in potentially large regional markets. If this is so then the future growth of production capacity in these countries is unlikely to result in increased exports to industrialised countries, and may also give rise to conflict with indigenous firms who do not have the advantage of such technical link-ups.

## Conclusion

The prospects for increased exports of consumer appliances and components from the Asian NICs will be determined mainly by the extent to which current 'best practices' in product and process technology can be adopted either directly by NIC firms or in collaboration with the leading Japanese firms. Particularly in the consumer appliance sector, future trends in protection remain important, not only because trade barriers may be used to restrict exports directly but also because they create an incentive to redirect foreign investment to industrialised countries. The available evidence suggests that both trends seem to be working to the disadvantage of the NICs at present. However, to set against this, there are also some signs that the pressure of competition in the consumer appliance sector is encouraging some of the main European firms to consider production locations in the NICs. It is possible that such moves might ultimately redirect the attention of Japanese firms towards the expansion of Asian production sites.

In any event, a fairly optimistic picture is presented by the broadly based official predictions of the NICs. Korean official forecasts suggest that total electronics exports will reach \$3 bn in 1981 (roughly six per cent

of world trade) and the government is aiming for a 21 per cent average annual increase in the value of exports by 1986. Taiwan is keeping roughly abreast with Korea, and Hong Kong expects to provide 2.5 per cent of the world market by 1985. Although Korea and Taiwan are predicted to experience export growth in colour TVs—by 12.5 per cent and 6 per cent respectively during 1980-85 [JAEU, July 1981]—Singapore exports of colour TVs are predicted to remain static and exports of most other products from NICs are expected to decline. Amongst the 'followers' only Indonesia and Malaysia are expected to produce an exportable surplus, and production in Thailand, Sri Lanka and the Philippines remains geared to meeting domestic demand.

It is extremely difficult to draw any concrete conclusions from such patchy data, but based upon current trends in protection and technological change, it seems likely that it will be more difficult for the NICs to increase production and exports of electronics products in the future. It is also likely that it will prove more difficult for the 'followers' to reduce dependence on labour-

intensive assembly activities in their attempts to move into the production of more technologically sophisticated products.

## References

- Asian Sources, Electronics*, 1980, November
- Cable, V. and J. Clarke, 1981, *British Electronics and Competition with Newly Industrialising Countries*, Overseas Development Institute, London
- Economist*, 1980, 28 June and 6 September
- Hong Kong Government, 1979, 'A study of Hong Kong's electronics and plastics industries', mimeo; (Memorandum for the Trade and Industry Advisory Board: Advisory Committee on Diversification)
- Journal of the Asian Electronics Union*, 1981, February and July
- Scribberas, E., 1979, 'Transfer of technology in the consumer electronics industry—the television sector', mimeo, OECD, Paris
- UNCTAD, 1978, *Electronics in Developing Countries: Issues in Transfer and Development of Technology*, UNCTAD TD/B/C./34, Geneva