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OFFSHORE CHIP ASSEMBLY

UCLA geographer Allen J. Scott has just concluded a study of the semiconductor industry in Southeast (and East) Asia. His report is to a large degree based on survey responses from 24 of the 63 U.S.-owned assembly plants in the region and 17 of the 44 locally-owned subcontract assembly shops.

Today, with numerous firms carrying out testing functions in Asia, a division of labor is emerging within the region. Respondents told Scott that 41.9% of the labor force at U.S. firms in Hong Kong and Singapore was engaged in testing operations, compared to 18.2% in the other countries studied.

Futhermore, capital intensity, particularly at U.S.-owned factories, is gradually increasing. Measuring the capital intensity of the textile and printed circuit board industries in Los Angeles, Scott contends, "By these standards, U.S.-owned assembly plants in South-East Asia today are not especially labor-intensive even though they do employ large (but diminishing) numbers of workers." He also finds, "Presumably, locally-owned plants cut back on quantities of fixed capital per worker as a way of minimizing the deleterious effects of [their] volatility."

Scott provides comprehensive, current (1985) data on the U.S. and locally-owned semiconductor industry in eight countries in the region. The locally-owned plants include integrated – that is wafer fab as well as assembly – facilities in Hong Kong (4), South Korea (5) and Taiwan (8). In most countries, total employment has fallen significantly during the current slump. Scott's survey did not cover Japanese or European-owned factories.

1985 Semiconductor Employment by Country

Country	#	US-Owned Employment	#	Locally-Owned Employment
Hong Kong	8	4,552	6	4,232
Indonesia	2	3,200		
Malaysia	14	38,136	2	1,450
Philippines	11	13,112	14	18,046
Singapore	11	10,397	1	240
South Korea	5	8,800	17	15,474
Taiwan	8	15,296	19	7,869
Thailand	4	6,470	2	900
Total	63	99,963	61	48,211

Scott also calculated average hourly wages in semiconductor assembly in each country, based upon his survey. Remember that the pay of workers in many countries includes daily, weekly, or monthly bonuses or living allowances. Consequently, the average hourly pay depends upon the length of the work-week, which varies with economic conditions.

1985 Wages in Semiconductor Assembly

Country	Wage (US\$)	# of Firms	Employ.
Hong Kong	1.33	5	3,749
Indonesia	.35	1	1,800
Malaysia	.84	6	11,776
Philippines	.63	8	11,021
Singapore	1.58	6	4,263
South Korea	1.19	3	13,073
Taiwan	1.36	7	3,196
Thailand	.43	3	868

(Source: Allen J. Scott, "The Semiconductor Industry in South-East Asia: Organization, Location, and the International Division of Labor," 1985, Department of Geography, UCLA, Los Angeles, CA, 90024)

INDONESIA

In 1973-74, when industry leaders Fairchild Semiconductor and National Semiconductor built chip assembly plants in Indonesia, it appeared that the populous island nation would join its neighbors as a center for offshore high-tech manufacturing. However, no other U.S.-based semiconductor firms set up shop there. Though Indonesia's production workers' wages are among the lowest in the world, its infrastructure is poor; corruption and bureaucracy run rampant; and skilled manpower is rare.

Now it appears that even National and Fairchild are on the way out. In December (*Asian Wall Street Journal*, December 9, 1985) National announced that it was laying off 750 of its 1300 employees in Bandung, already down from a peak of 2800 in late 1983.

National plans to keep its plant open, but Fairchild announced in February that it intends to shut its Jakarta factory. Fairchild currently employs a reported 600 workers, down from a few thousand in the early 1980's. (*Peninsula Times Tribune*, February 4, 1986)

T.V. CAMERAS

While the U.S. television camera industry remains relatively stable, serving the high end of the market, imports of consumer-grade cameras have skyrocketed over the past few years. Not surprisingly, most have come from Japan.

There are as many as ten companies producing TV cameras in the U.S., employing about 6,000 workers in 1984. "The U.S. industry concentrates principally on cameras for commercial, industrial, and military applications. . ." Despite rising imports and falling exports, U.S. production has grown, though not nearly so fast as the domestic market.

Trade Data on Television Cameras and Parts
(figures are for millions of U.S. dollars)

Year	US Shipments	Exports	Imports	US Market
1980	187	63	132	255
1981	215	64	243	394
1982	198	59	268	406
1983	227	45	297	480
1984	252	39	496	710

Japanese exports of television cameras and parts to the U.S., most of which were color cameras valued at less than \$2,000 apiece – that is, for home use – rose from \$117 million in 1980 to \$480 million in 1984. Japan accounts for nearly all TV cameras brought into the U.S.

Japanese Market Share in U.S.

Year	% Color TV Imports	% Imports	% US Market
1980	97.5	88.9	45.9
1981	98.9	94.7	58.4
1982	98.4	94.4	62.2
1983	97.9	94.0	58.3
1984	99.2	96.6	67.6

(Source: "Television Cameras, TSUS Items 684.90," Summary of Trade and Tariff Information, U.S. International Trade Commission Publication 841, Control No. 6-5-9 [Second Supp.], December, 1985)

ELECTRONIC BANKING

The widespread use of computer technology in the front offices of retail banks is routinizing traditional clerical tasks, but the increasing variety of bank services and accounts is placing new demands upon bank workers. Bank tellers are now financial service *sellers*, responsible for offering customers numerous choices for investing their money. Not only must bank employees understand a wide range of accounts and services, but they need a high level of problem-solving and commu-

nicative skills. (Francisco Bosch-Font, "Retail Banking and Technology: An Analysis of Skill Mix Transformation," Institute for Research on Educational Finance and Governance, program report 85-B3, Stanford University School of Education, August, 1985)

Bosch-Font's study is based upon Spain's experience, but he says "the Spanish case is largely representative of what has been happening in banking in other western industrialized countries such as in Western Europe and the U.S." In fact, the use of debit cards is more advanced in Spain than in the U.S.

Meanwhile, the Bank of America's HomeBanking service, through which owners of personal computers can bank on-line for an \$8 per month service charge, has been growing slowly. The Bank, which had hoped to sign up 25,000 users by the end of 1984, only has about 20,300 users, roughly one third of the total U.S. customer base for computerized home banking. (San Jose Business Journal, October 28, 1985)

To attract new users, the Bank of America is teaming up with Monogram, developer of the Dollars and Sense software package for Apple and IBM PC-compatible computers. They are offering Moneylink, a program that allows users to prepare bank transactions off-line before sending instructions to the bank and which also supports the downloading of data, for processing with Dollars and Sense. Until Moneylink became available, customers had to use their computers as dumb terminals.

Monogram is reportedly offering a similar package to subscribers of other electronic banking services, including the one offered by Citibank.

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PHILIPPINE IN-FIGHTING

Philippine businessman in exile, Vicente Chuidian, has settled his dispute with the Marcos government over the ownership and debts of the Interlek-Dynetics family of companies. The Philippine government has reportedly agreed to pay Chuidian a total of US\$5.3 million for ownership of Dynetics, the Philippine chip assembly subcontractor, and the Asian Reliability Company, Inc. (ARCI), but he will retain control of ARCI's Silicon Valley affiliates. Chuidian will not be held responsible for ARCI's \$25 million in loans from foreign banks.

The agreement, which is technically an out-of-court settlement of legal cases in the U.S., stipulates that "the companies' books contain no evidence that the Marcos family ever were stockholders." Associates of Chuidian who were privy to the negotiations charge that Marcos was personally involved in the case. (San Jose Mercury News, January 18, 1986)

Meanwhile, Chuidian's plan to build an assembly factory on Vancouver Island, British Columbia, has collapsed. The right-wing provincial government touted the proposed operation, called Dynatek, as a linchpin of its strategy to turn the area into the Silicon Valley of the North, but if the venture had been successful, it would merely have turned it into the Philippines of the West. Though both the BC and Canadian governments were to have subsidized Dynatek, Chuidian says it could not raise enough capital from private Canadian investors. (The Transmitter, Telecommunications Workers Union, February, 1986. For background, see Global Electronics, February, March, and June, 1985)

HYDROGEN CHLORIDE

Two recent leaks of hydrogen chloride gas in the Silicon Valley region should remind both workers and residents that high-technology electronics is a dangerous industry. On February 11, at least 4,000 gallons of hydrochloric acid spilled from a broken pipe at C.P. Inorganics in Union City, just northeast of Silicon Valley, forming a white cloud of toxic vapor. About 3,000 workers, shoppers, and commuters were evacuated, and major freeways and the local line of Bay Area Rapid Transit were closed at rush hour, creating a massive traffic jam. The company supplies chemicals to printed circuit board fabricators. (San Jose Mercury News, February 12, 1986)

Later in the month, National Semiconductor evacuated a production building in Santa Clara several times as several employees complained of sore throats, caused by an unexplained leak of hydrogen chloride. Chemical alarms, designed to warn of such leaks, worked intermittently. The San Jose Mercury News (February 21, 1986) reported, "One theory is that the prevailing south wind during the recent storms blew some of the exhaust, which normally dissipates into the atmosphere, back into the air conditioning intake system." This has apparently happened before at other plants. In some cases, the facades which hide the "smokestacks" - vents - of high-tech factories prevent full ventilation.

TOXIC SEWAGE

Prodded by environmental organizations such as Citizens for a Better Environment, regulatory agencies are slowly bringing printed circuit board fabricators and other metal finishing operations into compliance with standards for the discharge of toxic materials into local sewage systems.

In the San Francisco Bay Area, a check by CBE in 1985 showed that the percentage of electroplating/metal finishing firms out of compliance with Federal standards for the pre-treatment of hazardous industrial wastes had fallen to 11% from 40% less than two years earlier. Some of the 39 businesses not meeting the standards are moving toward compliance. Violations include the discharge of copper, lead, and cyanide into the waste stream. Most of the Bay Area violators are small printed circuit board manufacturers.

In the Los Angeles area, however, where CBE has been less active, the percentage of violators among the same industrial categories remains at 32%, a total of 329 firms. (Toxics Down the Drain, CBE, San Francisco and Los Angeles, November, 1985.)

FRENCH TERMINALS

Videotex - that is, information utilities based upon computer terminals and telephones - is taking hold much more rapidly in France than the rest of the world. The French system handles 15 million calls per month. About half are to find telephone numbers. Another 30% are for home-oriented information services, established by entrepreneurs but funded by a two-thirds share of the connect-time fee (for each individual call) that subscribers pay to the government-run telecommunications agency. The system's high volume is the direct result of official policy. Terminals, produced for about \$165 each, are given to customers. Consequently, the "electronic cottage" is within reach of all French households. By 1990, 30% of the country's 23 million phone lines will be plugged in. (Business Week, January 20, 1986)

INDIAN SILICON

Prime Minister Rajiv Gandhi has intervened to delay an Indian Department of Electronics plan to manufacture electronics-grade silicon with technology imported from a U.S. firm, Hemlock Semiconductors. (See Global Electronics, July, 1985.) Meanwhile, Metkem Silicon, an Indian-owned private firm, is beginning ultra-pure silicon production at a 25-ton per year plant at Mettur, using a process developed at the Indian Institute of Science at Bangalore. The Far Eastern Economic Review (January 23, 1986) reports that the government will have to evaluate Metkem's claims that it can produce high-grade silicon before the Electronics Department plant can be built.

HIGH-TECH ORGANIZERS

Last May, dozens of labor, environmental, health and safety, and peace activists from high-tech centers throughout the U.S. met in Silicon Valley to form the Integrated Circuit, The National Network for a New High Tech Agenda. At that meeting, participants also laid the groundwork for an international conference of high-tech organizers to be held in Boston in 1987.

The founding document of the Integrated Circuit – a report of the initial meeting plus the conference proposal – can be ordered from the Integrated Circuit, East Coast Committee, Box 1342, Brookline, MA, 02146, for US\$3.00. Soon, a High Tech Resource Directory will be available from the Circuit, also for US\$3.00.

A.I.D. PROMOTES

In the December, 1985, issue of Global Electronics, we reported that the CPA firm of Coopers & Lybrand was "apparently under contract to promote offshore assembly" in Sri Lanka and the English-speaking Caribbean.

We have since confirmed that the firm is under contract with the U.S. Agency for International Development "to assist, without charge, companies considering offshore manufacturing" in those locations.

COMPUTERIZED LANGUAGE

Modern computers, with high speed processors, large memories, and sophisticated software, can "understand" simple forms of natural human language. And the Pentagon is funding natural language projects through its Strategic Computing program, apparently in the belief that new generations of hardware and software can make it possible to use computerized language interpretation in systems used for the command and control of military forces.

However, linguist Geoff Pullum argues, "natural language processing will only work in a usable way under certain limited conditions, and the context of rapidly developing military confrontation embodies the very antithesis of those conditions. Computers, lacking "common sense" – years of human experience with spoken language – cannot be expected to sort out ambiguities in speech.

While he believes that language processing is appropriate for applications where errors have minor impact or can easily be corrected, he argues that the misinterpretation of military commands or data can instantly cause an irreversible catastrophe. (Geoffrey K. Pullum, "Natural Language Interfaces and Strategic Computing," Silicon Valley Research Group Working Paper No. 5, January, 1986, University of California, Santa Cruz, \$1.50 plus shipping)

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