Lovio, Raimo

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ETLA ELINKEINOELÄMÄN TUTKIMUSLAITOS
THE RESEARCH INSTITUTE OF THE FINNISH ECONOMY
Lönnrotinkatu 4 B 00120 Helsinki Finland Tel. 609900 Telefax 601753

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Raimo Lovio

THE INFLUENCE OF FOREIGN COMPANIES ON THE BIRTH AND DEVELOPMENT OF THE FINNISH ELECTRONICS INDUSTRY*

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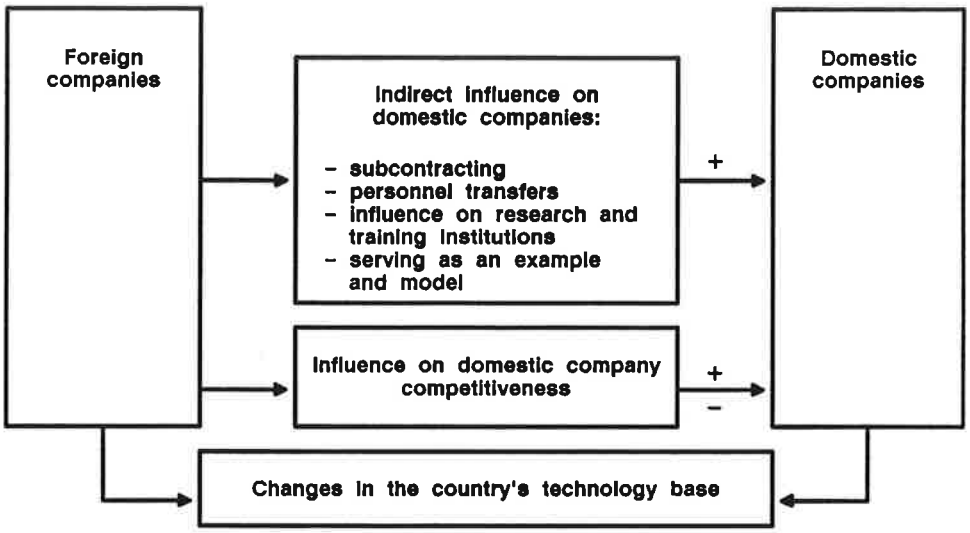
ABSTRACT: This article examines the influence of foreign companies on the birth and development of the electronics industry in Finland. It is demonstrated that by international comparison foreign companies have played a minor role in the development of the Finnish electronics industry. Quantitatively, the foreign influence on the Finnish electronics industry can be represented with a U-curve. The influence was most pronounced at the birth of the old electronics industry, declining then markedly until the internationalization of the industry occasioned another upward trend. At the same time, the role of foreign companies changed from that of technology importer into technology exporter. At the early stages, their main significance laid in setting up companies in Finland, which as such helped diversify the country's industrial production and indirectly channel technology diffusion in industry. At the later stages, their second major contribution was to offer skills, channels, and resources for exporting Finnish knowhow, a worthy alternative when the resources at home were insufficient for international expansion. Finally, the article discusses how the traditional diffusion model could be expanded for a better understanding of the old and new foreign companies' role.

KEY WORDS: technology diffusion, foreign companies, Finland

1. Introduction

Direct foreign investments constitute one channel of international technology diffusion. In setting up operations overseas or buying a business there, a company will always transfer a certain amount of its knowhow into the host country with the result that the mere presence of the knowhow may diversify the industrial structure of the target country. Furthermore, the company's performance will benefit other companies at home through subcontracts, personnel transfers, and other forms of cooperation (Figure 1).

Figure 1. The Role of Foreign Companies in Traditional Technology Diffusion Models



The quantity and contents of the transferred knowhow vary considerably, however, and the effect of the knowhow can, in fact, be negative on the receiving country if the foreign company ends up displacing emerging domestic business without introducing new technology in return. Consequently, examination of the influence of foreign technology implants always presupposes a careful qualitative analysis.

This paper will concisely examine the influence of foreign companies on the birth and development of the electronics industry in Finland. First, I will demonstrate that by international comparison foreign companies have played a minor role in the development of the Finnish electronics industry. I then proceed to show that within a decade the essence of that role has completely changed: foreign-owned electronics enterprises in Finland have increasingly been transforming themselves from electronics importers into electronics exporters. Finally and as a follow-up to the above, I will discuss how the traditional diffusion model, as sketched in Figure 1, could be expanded for a better understanding of the new foreign company role.

2. The Relatively Minor Role of Foreign Investment

Timo Myllyntaus (1990) has shown that in the technology tranfers to Finland toward the end of the 19th and the beginning of the 20th century the role of foreign investment was

rather insignificant in comparison to other existing channels (plant and equipment imports, licence acquisitions, immigration, overseas studies, and general diffusion). With respect to the Finnish electronics industry, foreign companies have played an equally minor role even though their position within the industry has admittedly been stronger than in most other lines of business in Finland.

The foreign company share was largest at the birth of the old electronics industry and lasted as late as the beginning of the 1960's. In 1960, the foreign-owned company share of employees in the Finnish electronics industry amounted to about 40 percent. With the accelerating development of the domestic electronics industry in the 1960's, the import of foreign firms suffered a gradual decline all the way to the mid-1980's to recover from then on.

In 1991, employees of foreign-owned electronics production plants in Finland numbered approximately 6 500 (cf. Table 1), slightly less than 25 percent of the total employed in the electronics industry. With the overseas plants of Finnish companies included (cf. Table 2), the foreign company share in Finland remained under 15 percent.

Table 1. The Largest Foreign-Owned Electronics Plants in Finland in 1991.

Owner	Company	No. of Employees
Fujitsu/ICL	Nokia Data	2400
ABB	Strömberg	1500
Siemens	Siemens	1026
LME	LME	707
Pharmacia	Wallac	486
Planar	Lohja EL-display unit	180
Alcatel	Puhelinteollisuus	100
Studsvik	Alnor (Wallac)	80
Total		6479

Sources: Talouselämä (The Finnish Business Journal) and other papers and publications.

In international comparison, the figure is relatively small. For example, in small OECD countries, comparable to Finland, such as Denmark, Norway, Austria, and Belgium, the foreign share in the national electronics industry has traditionally been greater than in Finland. The case is even clearer in countries like Ireland, Scotland, Greece, Portugal, and Spain (cf. the various articles in Freeman & Lundvall, eds., 1988).

We have to consider, too, that foreign companies in Finland provide far fewer jobs in the electronics industry than do Finnish-owned companies overseas. Tables 1 and 2 show that in 1991 foreign companies employed some 6 500 people in Finland while Finnish companies employed over 14 000 people overseas.

Table 2. The Overseas Electronics Production Plants of Finnish Companies in 1991.

Company	No. of countries	No. of Employees
Nokia	7	10 142
Finvest	3	1 155
Valmet	4	701
Fiskars	3	460
Helvar	1	410
Ahlström	2	400
Labsystems	2	280
Teleste	3	240
Metra	1	125
Outokumpu	1	108
Vaisala	1	72
Instrumentarium	1	57
Kone	1	44
IVO	1	42
Total		14 236

Source: Talouselämä 34/1991

Several factors contribute to the relatively small number of foreign companies in Finland in general and in the electronics industry in particular. First of all, the market in Finland is so limited that large international corporations see no reason to set up production operations in the country. Secondly, Finland's usefulness as a convenient location for electronics production is hampered by her remoteness from important European markets and by her fairly rapidly increased costs. Moreover, until the 1980's, Finland hardly had the kind of electronics industry that would have appealed to foreign investors.

These economic factors have to be complemented with a few words on Finnish economic nationalism. Investments in Finland and the buying of companies in particular by multinational corporations have met with a rather reserved and unwelcoming reception even as late as the 1980's. In the electronics industry, the history of the Strömberg company provides a representative example of the particular attitude.

Altogether four attempts were made by foreign companies to buy Strömberg, the first three of them torpedoed by the Finns. The first time, in 1918 through 1921, both ASEA and Siemens sought to negotiate themselves into a controlling position in Strömberg, but their offers were turned down despite the then crisis of the company. The second attempt was marked by ASEA's secretly securing the majority share of Strömberg in 1929, a move countered by the company's Finnish management by bringing in ASEA's fiercest rival BBC as an equal owner. Within this set-up of two rival foreign owners, the Finnish management could operate fairly unrestrained. Then during the war, by exploiting the new alien legislation to redistribute the stocks, the acting management succeeded in returning the

majority ownership to Finnish hands despite ASEA and BBC's resistance. The third time in 1962, ASEA again offered to buy Strömberg but was rebuffed as before. This time the Parliament even passed a resolution which "placed the government under the obligation carefully to follow the developments in the ASEA venture and to seek measures to prevent Finnish industry from being drawn into the sphere of foreign cartels" (Hoffman 1989, 378).

The fourth attempt finally turned out successful. To consolidate Strömberg's diffuse ownership, the principal financier SYP (Union Bank of Finland) had since the late 1970's been looking out for a new owner base for the company. The problem was temporarily solved in 1982 by transferring the company under the ownership of Kymi. In the merger of two forest industry companies Kymi and Kaukas it became necessary to separate Strömberg from the forestry concern. Again ASEA promptly stepped in with an offer to buy Strömberg. Mr. Mika Tiivola, the then president of SYP, described ASEA's successful approach in an interview:

> "After the agenda had been discussed, Peter Wallenberg unexpectedly brought up the matter of Strömberg. He said he recalled how a downright storm of protests had broken out in Finland in the early 1960's over ASEA's move to become a shareholder in Strömberg. At the time, of course, the plans fell through.
>
> - "What do you think would happen now if a Swedish firm were to buy a well-known Finnish company?
>
> Mr. Tiivola remarked that, of course, everything had changed. "Nowadays companies are being bought across borders. Finns have got used to the fact that Finnish companies acquire companies in Sweden and many other countries, the United States included. I doubt that Swedes' buying companies in Finland now would cause such a furore as was the case with Strömberg back then" (Poukka 1987, 186-187).

Mr. Tiivola was correct, and the deal was finalized shortly afterwards without protestation. Only Wärtsilä submitted later that it too had been interested in becoming the principal shareholder in Strömberg.

The subsidence of the vehement resistance to foreign ownership has in recent years been increasing foreign companies' chances to come and invest in Finland. And they have, indeed, taken up the opportunity in the electronics industry as well as in other fields (e.g. the purchase of the Valmet elevator factory by Otis and the Wärtsilä shipyards by Kvaerner).

3. The Changing Role of Foreign Companies

There have been both quantitative and qualitative changes in the significance foreign companies hold for the Finnish electronics industry. Three clearly delineated periods can be observed in this development: from and including the birth of the industry in the 1920's to the mid-1960's; between 1965-1985; and the internationalization of the industry since the mid-1980s.

3.1. The Birth of the Electronics Industry: Foreign Companies as Important Importers of the Technology

By the mid-1960's five foreign-owned production units had emerged in the Finnish electronics industry. In the order of appearance they were Siemens (1898, production since the early 1930's), LM Ericsson (1918, production since 1942), Philips (1935), AGA (1958), and ITT (1962).

Siemens, LME, and AGA set up their own plants while Philips and ITT began operations in Finnish-founded companies, which they had bought and then proceeded systematically to develop.

In the early 1960's, foreign companies owned an appreciable slice of the Finnish electronics industry with an employee share of almost 40 percent. Siemens, LME, and ITT were unarguably the dominant companies in the telecommunications sector, the second major division of the electronics industry. In fact, the biggest radio and TV manufacturer in Finland was an affiliate of Philips.

The motivation for the five companies' being in Finland was to manufacture for the Finnish market. Production had been moved to Finland for many reasons: to minimize transportation costs, to circumvent foreign trade regulations, to meet the considerable installation demand, etc.

In terms of technology diffusion, the companies were definitely importers of technology. They brought into Finland telecommunications and consumer electronics-related know-how, which then spread in roundabout ways, as elaborated in Figure 1, and became the springboard for the development of the domestic industry. Furthermore, owing to their strong competitive positions in the two sectors, the foreign firms did not hamper the progress of the domestic industry. Domestic telecom technology was being developed in the governmental Valtion Sähköpaja (The State Electric Works; called Televa since 1961). The Philips and AGA radio and TV manufacture was more than matched by their three Finnish competitors Helvar, Salora, and ASA.

The overall evaluation of the foreign role at the beginning of the electronics industry in Finland is thus positive. Any further evaluation of that role would require a more exact diffusion study.

3.2. The Growth Phase of the Domestic Electronics Industry: The Diminishing and Changing Role of Foreign Companies

The early 1960's saw the development of the modern semiconductor-based electronics industry, first in the form of transistor technology and then from the mid-1970's onwards as microelectronics. The old product lines of the industry--telecommunications and consumer electronics--went through a technical renewal with the concomitant introduction of new product lines: semiconductor components, computers, industrial and medical electronics.

During this period, the number of foreign companies in Finland diminished significantly. Among the early arrivals, Philips and AGA gave up their consumer electronics manufacture in Finland, and no foreign ventures emerged in the new component, computer, or industrial

electronics sectors. Only one notable Finnish medical electronics concern changed into foreign hands when the Swedish company, LKB, bought Wallac in 1969.

The dynamic developer's role in the Finnish electronics industry then clearly passed from foreign back to domestic, mainly large established, companies. Consequently, the share of foreign company employees in the Finnish electronics industry fell from just below 40 percent in 1960 to about 11 percent in 1985. In 1985, no foreign company held a leading position in any of the major sectors of the industry. Competition was fiercest in the telecommunications sector, but even there the rallying of forces at home (Nokia and Televa) laid the groundwork for the development of the domestic industry.

At the time also the motives for foreign manufacture in Finland began to change. Siemens was the only company to follow the tried old pattern, manufacture for the Finnish market, whereas LME and ITT marketed their products also in the Soviet Union, LME even in western Europe. Initially a radio and TV manufacturer for the Finnish market, Philips turned in the late 1960's into a hi-fi systems manufacturing facility for the EFTA market, which absorbed 90 percent of its output. The plant was closed in the early 1980's when Philips concentrated its production in Sweden.

The latest trend was initiated by the LKB takeover of Wallac in 1969. A small Finnish company had succeeded in bringing about significant innovations in medical technology but lacked sufficient resources to turn them into marketable exports. LKB took over the role of creating a market network for the innovations and supporting continued reasearch.

3.3. The Internationalization of the Electronics Industry: Foreign Companies as Exporters of the Technology

The Finnish electronics industry got off to a rapid internationalization process after the mid-1980's, and Finnish companies were buying foreign companies at an increasing rate from 1982 on. In 1989, they had already reached the point where the Finnish-owned electronics branches had as many employees overseas as the industry at home. Correspondingly, Finnish companies were selling their plants at home to foreigners.

As mentioned above, ASEA bought Strömberg in 1986. The U.S. based Combustion took over the Nokia industrial electronics facility Afora in 1987 (later to come under ABB). Similarly, the U.S. based Planar acquired the majority stocks of the Lohja EL-display in 1990 and Fujitsu/ICL that of Nokia Data in 1991. As a result of these and some smaller company takeovers, the share of employees in foreign-owned companies in the Finnish electronics industry climbed from c. 11 percent in 1985 to c. 25 percent in 1991.

As a consequence of the changes in the latter 1980's, a clear majority of the currently foreign-owned companies in Finland are originally Finnish- developed enterprises which besides supplying the home market are also vigorously exporting their products with foreign company backup in marketing, financing, and management. Within the ABB concern, Strömberg shoulders a worldwide responsibility for some of the product sectors developed in Finland. The role of Nokia Data inside ICL is to cater for the Scandinavian market, particularly with respect to the development of PC networks. Within the Planar concern, the manufacture of certain types of EL-displays has been assigned to the previously Lohja-owned EL-unit. Among the foreign-founded companies, LME has become mainly a provider of product development for the other divisions of the concern.

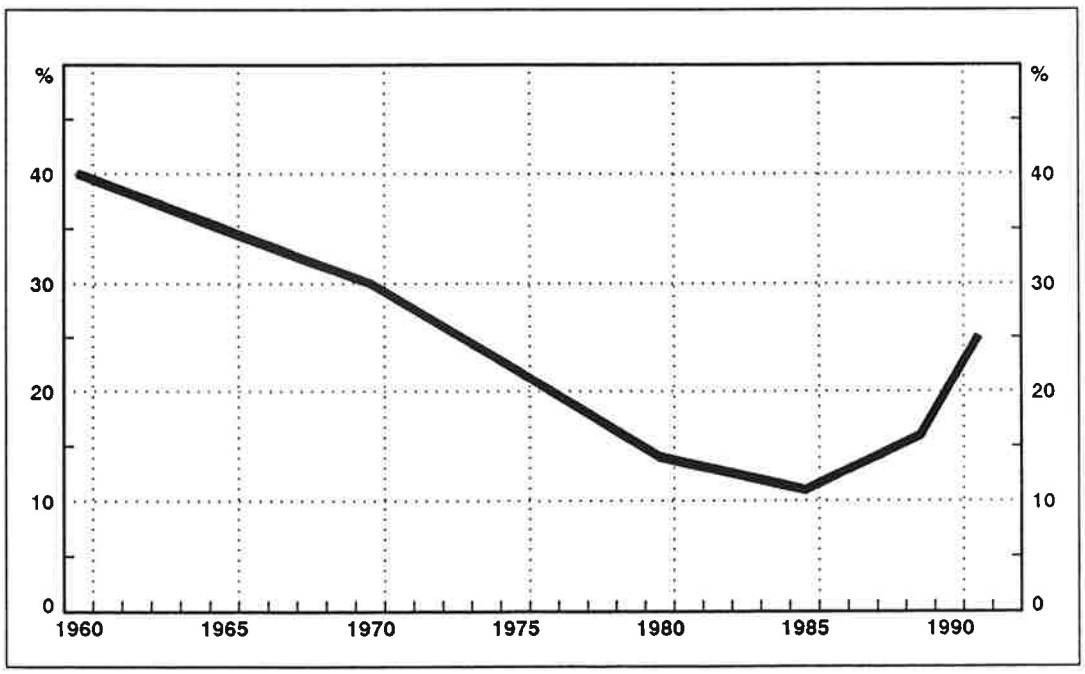
In the above situation, the impact of foreign ownership on Finnish industry crucially depends on the role the plants in Finland acquire in the long term or rather manage to acquire within the multinational enterprises. So far the outlook has been good for the plants in Finland. Towards the end of the 1980's, Wallac, however, became the focus of a serious conflict when its Swedish owner proposed to transfer the company product development into Sweden. Vehement resistance on the part of the Finnish employees eventually reversed the plan.

4. Foreign Companies and the Diffusion of Technology: An Expanded Model

Summarizing the above developmental trends, we come up with the following conclusion. Quantitatively, the foreign influence on the Finnish electronics industry can be represented with a U-shape curve (cf. Figure 2). The influence was most pronounced at the birth of the old electronics industry, declining then markedly until the internationalization of the industry occasioned another upward trend.

At the same time, the role of foreign companies changed from that of technology importer into technology exporter. At the early stages, their main significance lay in setting up companies in Finland, which as such helped diversify the country's industrial production and indirectly channel technology diffusion in industry. At the later stages, their second major contribution was to offer skills, channels, and resources for exporting Finnish know-

Figure 2. The Foreign Company Share of Employees in the Finnish Electronics Industry (the figures are partly estimates)

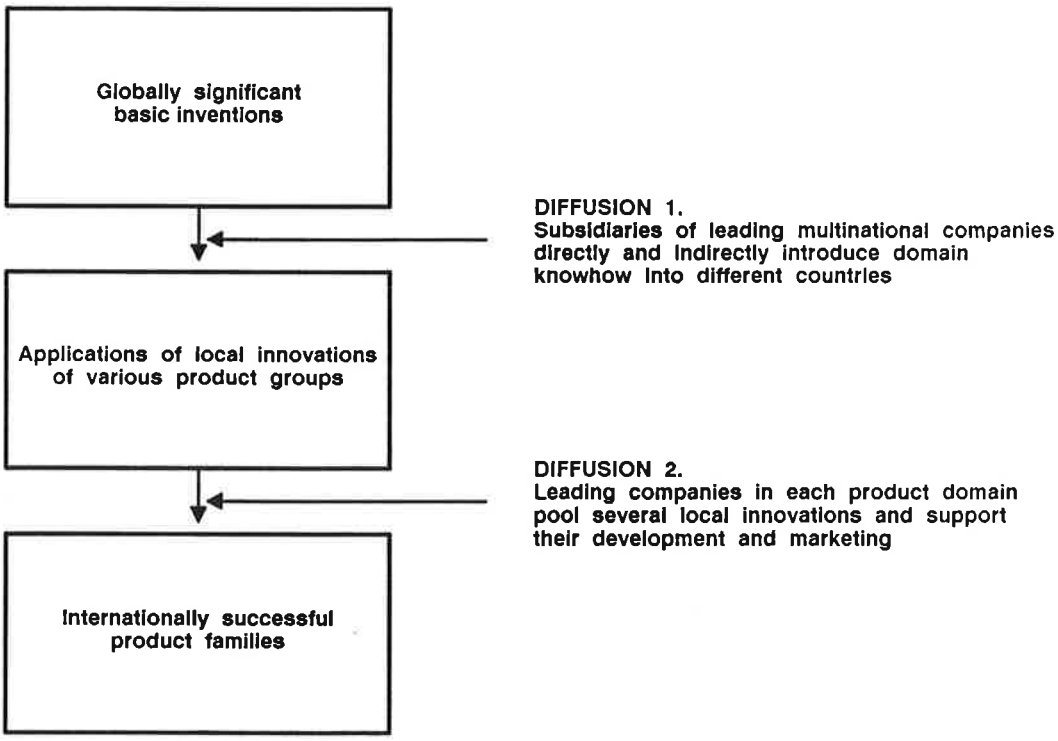


Sources: Lovio 1989 and newspapers and periodicals

how, a worthy alternative when the resources at home were insufficient for international expansion. The above change coincides with the process demonstrated by Jussi Raumolin (1988) whereby the Finnish forestry and mining industry changed from the object into the subject of technology transfer.

Consequently, the traditional diffusion model, presented at the beginning, has to be expanded. One possibility is to divide the diffusion process into two phases. The point of departure would be a globally significant, basic technology invention (such as in electronics the vacuum tube, the transistor, and the microprocessor). In most cases, the diffusion of this basic invention proceeds so that at different times in different countries local innovations are generated out of the original idea for surrounding markets. In the second phase, the local innovations seek to become global products. Whereas in the first phase, leading internationally established enterprises act as a technology diffusion channel to bring about and support the local innovations, in the second phase, leading enterprises of various product domains pool the local innovations from several countries and turn them into internationally competitive product families (cf. Figure 3). In the case of the Finnish electronics industry, Siemens, Philips, ITT, and LME served as the first phase technology diffusion channels and were superseded in the second phase by ABB, ICL, Planar, and Pharmacia.

Figure 3. The Role of Foreign Companies in the Expanded Diffusion Model



The above two phases proceed concurrently. Although many foreign companies already contribute almost exclusively to the second phase diffusion in the Finnish electronics industry, some of them (e.g. Siemens) remain devoted to the first phase diffusion. In a way the second phase tasks are also built upon the preceding ones; consequently, moving ahead to technology exporting does not mean a complete abandonment of technology imports.

5. Summary

An exact comprehensive analysis of the foreign company influence on the birth and development of the Finnish electronics industry would require a more detailed study than has been done above of the direct and indirect impacts involved. Based on the above rather general material, we can, however, conclude that the influence of foreign companies has undoubtedly been positive. At the beginning, they served as a route for the diffusion of new technology in Finland; by now they have also paved an outbound lane for Finnish knowhow overseas.

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THE RESEARCH INSTITUTE OF THE FINNISH ECONOMY
LÖNNROTINKATU 4 B, SF-00120 HELSINKI

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