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CLOTHING INDUSTRY: CAN THE NEW TECHNOLOGIES REVERSE THE CURRENT TRENDS?*

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ABSTRACT: The paper reviews international developments in the clothing industry and compares the performance of the Finnish clothing industry with these developments, as well as the diffusion of new technologies in Finland and in other countries. Finnish clothing firms have adopted new technologies quite rapidly, and staying in the technological forefront is a necessary prerequisite for maintaining competitiveness. However, the current trends of decreasing output volume and employment as well as increasing import penetration are likely to continue for the next 10-15 years. At the same time the adoption of new technologies will have several implications for the characteristics of production, the competitive situation and the structure of the industry. During the adjustment period ahead a competitive edge can be created by the effective use of new technologies, design, marketing and management skills.

KEY WORDS: Technological change, economic performance, clothing industry, Finland

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CLOTHING INDUSTRY: CAN THE NEW TECHNOLOGIES REVERSE THE CURRENT TRENDS?

1. INTRODUCTION

In most industrial countries the clothing industry has long been characterised as being a technologically unprogressive, declining industry with significant reductions in employment, diminishing or slow growth of output and poor export performance. From a global point of view the production of clothes has gradually been moving to developing countries.

In the 1960s the clothing industry accounted for about 8 % of total manufacturing employment in the OECD area, the corresponding figure today being about 3-4 %. This course of development is usually explained by increased productivity and the low wage costs of new producers in developing and NIC-countries. Since the production process is very labour intensive, labour costs are seen to be a decisive factor in determining international competitive advantages. There are, however, some industrial countries (e.g. Finland, Italy and France), where the clothing industry has shown relatively vital growth until recent years. This illustrates that the labour costs alone do not determine the international competitiveness of the clothing sector. There are in addition a number of demand side factors related to product differentiation, rapidly changing consumer preferences, fluctuations in fashion etc., that can bring about a specific competitive edge.

Recently there has been wide discussion in industrial countries about the opportunities provided by applications of microelectronic technologies in clothing production to improve productivity and compensate for - at least to some extent - the huge differences in labour costs.[1)]

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1) See, e.g., Rush-Hoffmann (1987) and Rush-Soete (1984).

Looking at the current situation in the Finnish clothing industry it becomes evident that the Finnish firms have lost a great deal of their competitive strength during the last few years. Two questions then arise: have the factors behind the previously strong performance lost their importance, and can the opportunities brought about by the new technologies lead to a reversal of the current trends?

In this paper we make a brief overview of the recent developments of the clothing industry in industrial countries and in Finland particularly. Then we try to evaluate the role of new technologies for the future development of the industry, focussing especially on the Finnish clothing sector.

2. THE CLOTHING INDUSTRY IN INDUSTRIAL COUNTRIES: SOME RECENT TRENDS

During the 1970s the pattern of international trade in clothing changed dramatically. The share of world exports held by developed market economies fell from more than 60 % in 1970 to under 40 % by the mid-80s (Table 1). This was to a large extent due to rapidly increasing exports from developing countries and - to a minor extent - from socialist countries. At the same time as the advanced market economies lost their export market shares, the output volumes and employment in the clothing sector decreased considerably. When looking at the industrial countries as a whole, the clothing sector has gone through an extensive restructuring process.

During the last couple of years the clothing production in many industrial countries has recovered, e.g. in the EC-area the output

Table 1. Clothing exports and world trade patterns, 1970-85

Year	World Trade (US $ Billion)	Exports of Developed Market Economies		Exports of Developing Market Economies	
		Value (US $ Bill.)	% of World Trade	Value	% of World Trade
1970	6.44	4.09	62	1.36	21
1973	12.59	6.92	55	3.82	31
1974	14.97	8.05	53	4.77	32
1975	16.73	9.00	54	5.40	32
1976	20.62	10.08	50	7.87	38.5
1977	23.50	11.80	50	8.70	37
1978	28.33	14.44	51	10.42	37.5
1979	34.37	17.83	52	12.35	35.5
1980	40.21	20.60	50	14.67	36.5
1981	41.10	19.10	46	16.86	41
1982	40.02	18.09	45	16.85	42
1983	40.37	17.79	44	17.39	43
1984	45.87	18.70	41	21.90	48
1985	49.42	19.49	39	24.92	50.5

Sources: Rush-Hoffman (1987) and UN Monthly Bulletin of Statistics.

volume rose from 1983 to 1986 by some 10 %, though it is still clearly lower than in the early 1970s. It is, however, too early to conclude whether the declining trend has come to an end. There are, namely, some transitory factors which have had a bearing on the improved performance of European clothing industries. First, the considerable appreciation of the US dollar against the European currencies until early 1985 weakened the competitiveness of many Southeast Asian countries which had largely fixed their currencies to the dollar[1)]. Secondly, there was an investment peak in European textile and clothing industries

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1) Cf. Structural developments... (1987), where it is pointed out that this mechanism acted the other way round during the 1970s.

around 1983-84 which strengthened their competitive position. Furthermore, the Multi Fibre Agreement (MFA) was renewed and extended in 1983 so that it was more restrictive regarding the imports of the most sensitive products to West European countries.[1)]

At the same time as the industrial countries saw a continuous decline in their clothing production, employment and exports, the developing countries expanded their production as an important element of their industrialization strategies. The share of the world clothing trade held by developing market economies has increased from 21 % in 1970 to more than 50 % in the mid-80s. This is explained not only by low wage costs but also by the nature of clothing technology. So far the technology has been easy to transfer from one country to another and the adoption of even the newest technological applications has been fast.

Table 2. Breakdown of textile and clothing production and world population, % (excluding centrally planned economies)

	1953	1970	1985
Industrial countries			
Share in production			
- of textiles	82	70	64
- of clothing	92	80	71
Share in world population	32	27	21
Developing and NIC-countries			
Share in production			
- of textiles	18	30	36
- of clothing	8	20	29
Share in world population	68	73	79

Source: Structural developments... (1987)

1) See Structural developments... (1987).

It is, however, worth noting that the major share of global textile and clothing production is still held by industrial countries: about two-thirds in textiles and 70 % in clothing (Table 2). Thus exports are of greater importance for developing countries than for industrial countries, which have so far been able to keep a substantial part of their home markets through protectionism and product specialization.

There have mainly been two kinds of reactions by the clothing firms and policy makers in industrial countries to the growing import penetration by the developing countries.[1] First, growing demands for increased protectionism have been presented. Second, the need has been recognised to improve productivity by means of innovations and new microelectronics-based technologies in order to improve international competitiveness.[2] The applications of new technology, ranging from computer-aided-design (CAD) and computer-controlled-machines to possibly full automation of the production process, have been seen as an opportunity for industrial countries to revitalize their apparel manufacturing. The R & D activity is heavily concentrated in some advanced countries. This suggests that the diffusion process of technology will play an important role in the clothing industry also in the future. However, when looking at the current situation, it is evident that no major technological leaps are to be seen in the short or medium term in spite of recent advances in parts of the production process. In section 4 we shall present a more detailed overview of the role of new technologies.

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1) Cf. Halttunen-Lariola (1979), Rush-Hoffmann (1987).
2) Cf. Rush-Hoffmann (1987), Rush-Soete (1984).

3. THE PERFORMANCE OF THE FINNISH CLOTHING INDUSTRY

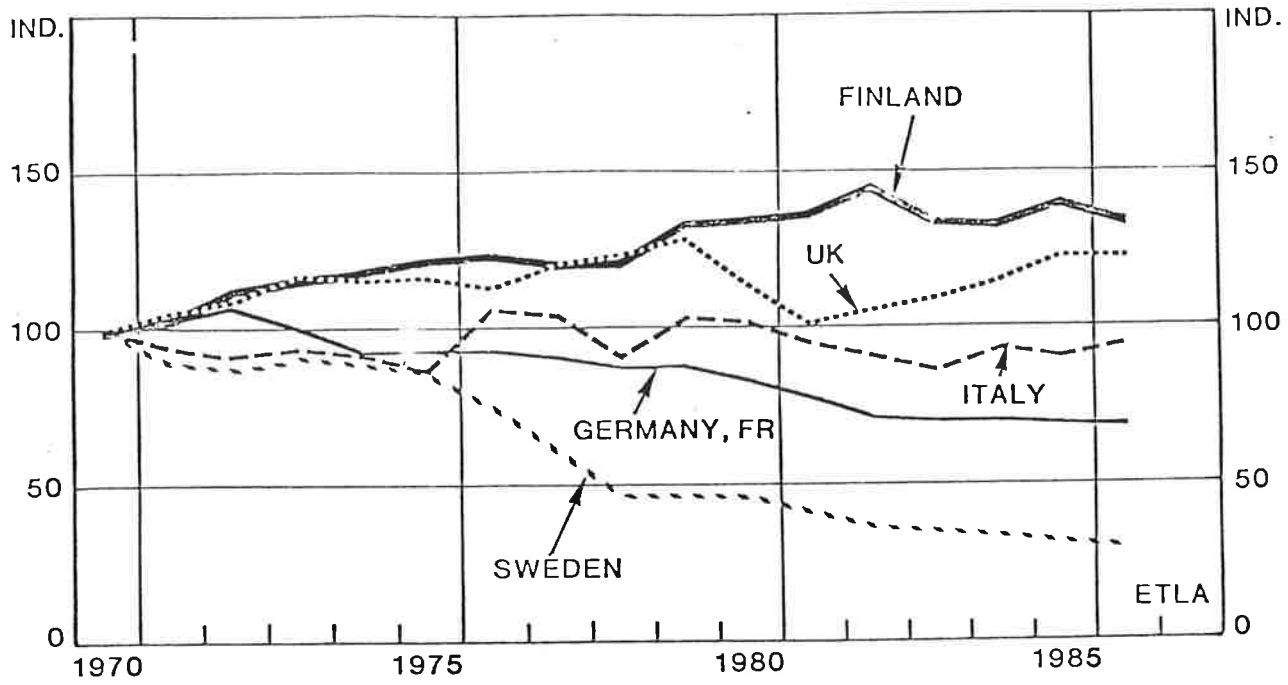
3.1. The clothing industry in an international perspective

Compared to most other Western industrialized countries, the textile and clothing industry has a relatively important role in the production structure of total manufacturing in Finland (see Table 3). There are only two countries in Western Europe where the output and employment shares of this sector in the output and employment of total manufacturing exceed those in Finland, namely Italy and Portugal. These countries are thus exceptions to the general rule that a high share of this sector in total output is associated with a relatively low level of industrial development. Despite considerable protectionist measures the shift of textile and clothing production from industrialized to less developed countries has been very rapid. This is true especially of the clothing industry, while the textile industries of the developed countries have experienced relatively smaller losses of competitiveness, at least partly because of a higher capital intensity. In some countries the decline in the volume of production of clothes has been dramatic (e.g. Sweden, see Fig. 1), whereas in Finland the development has been much more favourable until quite recently. On the

Table 3. Share of value added and employment of the clothing industry in those of total manufacturing in selected countries, 1983, %

	Valued added	Employment
Italy	3.3	5.1
Finland	3.3	6.0
Spain	2.8	4.8
Austria	2.6	5.1
USA	2.6	5.7
Denmark	1.7	3.0
Japan	1.5	4.2
Germany, FR.	1.3	2.6
Norway	1.0	1.6
Sweden	0.7	1.5

Figure 1. Output volume (value added) of the clothing industry in selected countries, 1970 = 100



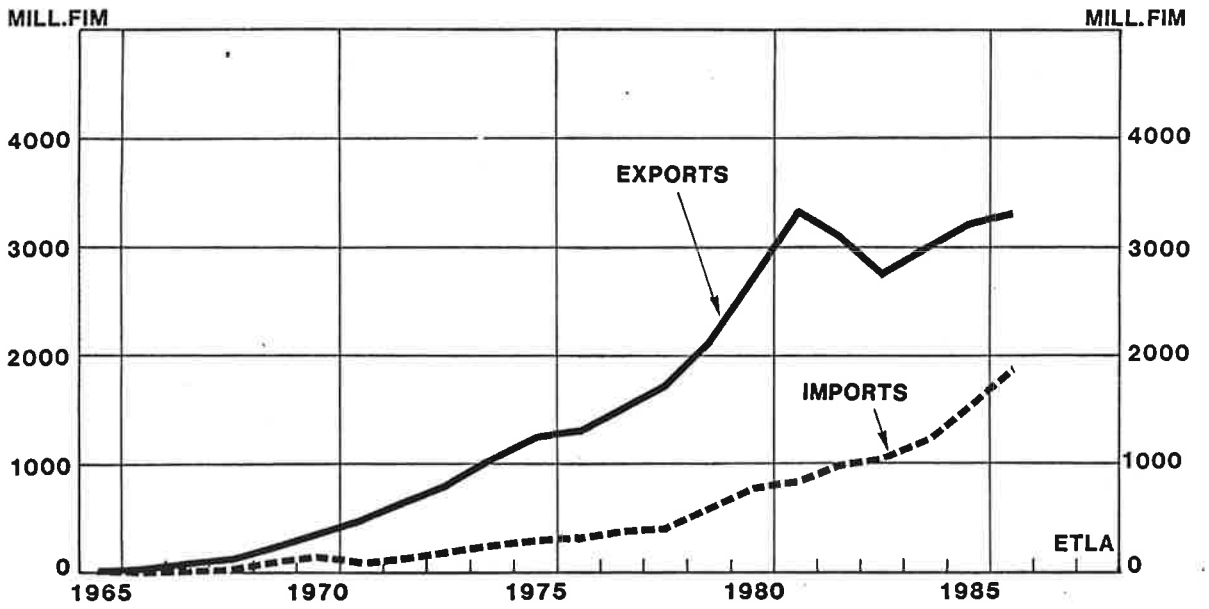
Sources: OECD, Indicators of industrial activity; UN, Yearbook of industrial statistics; Annuario di statistiche industriali, Instituto Centrale di Statistica (Italy).

other hand and in contrast to many other countries, the output and especially employment performance of the Finnish textile industry has since the mid-70s been much weaker than in the clothing industry.

As noted in section 2, the share of developed market economies in world clothing exports fell rapidly in the 1970s. However, increasing imports from the developing countries were only one reason for the rapid decline in employment in the clothing industries of most developed countries. For instance, in Europe some 380.000 jobs were lost between 1972 and 1977. According to many studies, advances in labour productivity have contributed more to job losses than trade effects. There is, however, much variation between individual countries in this respect. (See Rush and Hoffman (1987), pp. 6-11).

Another exceptional feature of the Finnish clothing industry is that Finland is among the few industrialized countries with a surplus in the foreign trade of clothes and related products. This surplus has, however, diminished rapidly in the last few years (Fig. 2). In the first half of 1987 the changes were even more dramatic than before: exports decreased by 8 % while imports increased by 40 %. These trends are estimated to continue, and thus the trade surplus is expected to turn into a deficit in the near future.

Figure 2. Finnish clothing exports and imports, 1965-86 (mill.FIM).



The favourable development of Finnish clothing exports in the 1970s was to a large extent due to rapidly growing demand in the main market areas (the Nordic countries and the Soviet Union). In the last few years this growth of demand has slowed down, and at the same time the price competitiveness of the Finnish clothing industry has deteriorated and import competition has increased in the home market. Because of

the bilateral nature of Finland's trade with the Soviet Union and the large share of oil imports in the trade, the large fluctuations in the price of oil in some years have caused considerable changes in the volume of exports to the Soviet markets, and the clothing industry has been especially dependent on this trade. The share of exports to the Soviet Union in the total output of the clothing industry was in some years as high as 20-30 %. Following the considerable drop in oil prices these exports have decreased during the last couple of years.

These developments have put the industry into a new and critical situation. To maintain international competitiveness and thus to remain in the market, the firms have to solve several problems related to efficient use of technology, design, marketing, management, etc.

3.2. Developments in the Finnish clothing industry since 1970

As mentioned in the previous section, the development of output in the Finnish clothing industry has so far been relatively favourable in comparison with international trends. Between 1970 and the peak of 1982 output increased by some 45 %, but after this period output volume started to decrease again, with the 1986 level some 8 % lower than that of the peak. This development has been accompanied by a decrease in the number of persons employed since 1975 (Fig. 3), but a still much less dramatic decrease than in many other industrialized countries. In 1986 the number of persons employed by the industry was 10 % lower than in 1970, but some 20 % lower than in 1975. Despite continuing unemployment in the economy, the industry has frequently suffered from a lack of skilled labour, and this may have caused some labour hoarding, which is reflected in the fairly slow development of labour productivity.

In the 1980s the structure of supply and demand in the market for clothing has clearly changed (see Table 4). This is mainly due to the fact that the share of exports in total domestic output has decreased from about 70 per cent in 1981 to about 59 per cent in 1986, or in other words, exports have grown much more slowly than domestic demand. At the same time the theoretical coverage by domestic output of total supply in the domestic market has diminished from about 2.3 times to about 1.6 times. The domestic market share of Finnish producers which was around 90 % in the beginning of the 1970s has almost continuously declined and was below 70 % in 1986. Imports have thus rapidly gained

Figure 3. Employment in the textile and clothing industries and in total manufacturing, 1970-86.

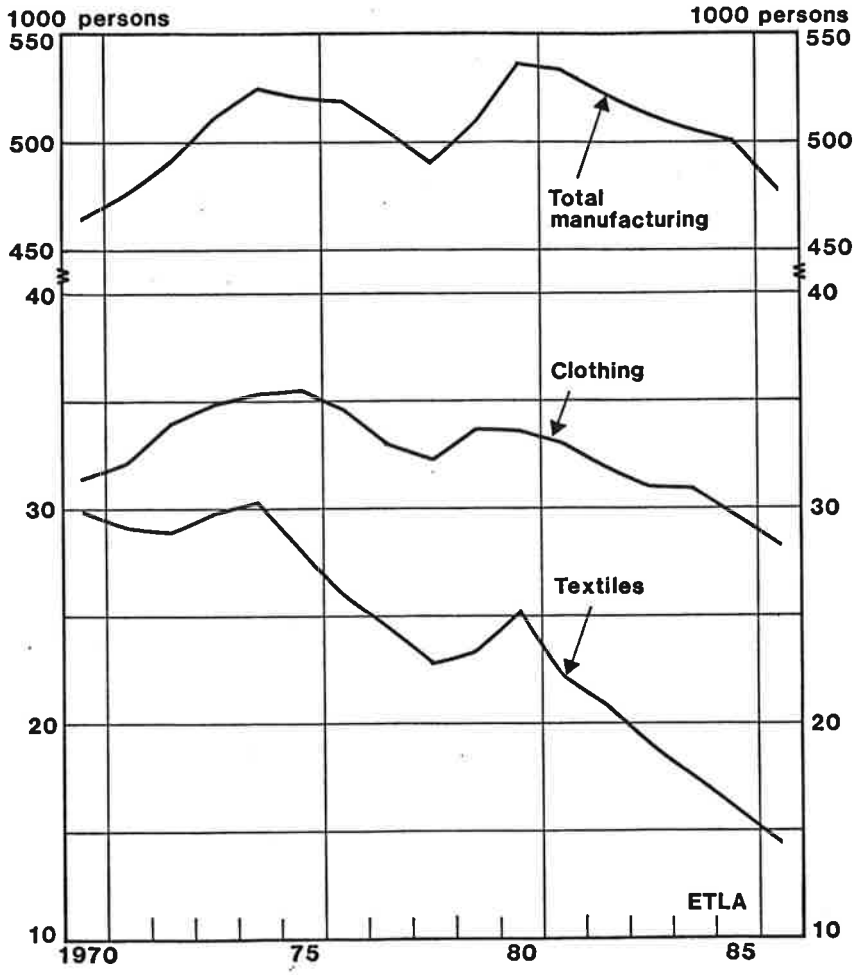


Table 4. Supply and demand in the clothing industry, as a per cent of total supply, 1980-86

	1980	1981	1982	1983	1984	1985	1986
1. Gross output[1)]	201.9	226.4	205.0	185.4	180.3	172.6	162.5
2. - Exports	133.2	157.6	130.1	110.9	106.5	102.4	95.8
3. Domestic sales	68.6	68.8	74.9	74.5	73.8	70.2	66.8
4. + Competing imports	31.4	31.2	25.1	25.5	26.2	29.8	33.2
5. Total supply = total demand	100	100	100	100	100	100	100
Total supply, mill. FIM	1772	1838	2078	2267	2525	2848	3124
Exports/domestic output(2/1x100)	66.0	69.6	63.5	59.8	59.1	59.3	58.9

1) Excluding internal intermediate inputs and services.
Source: Tekstiilivaltuuskunta (Association of Finnish Textile Industries)

a larger market share. An important feature of the growing imports is that they come not so much from the low-wage countries but rather from the developed European countries, especially the EC region. Because of a relatively high level of quality and design, these imports largely compete in the same market segments as the majority of domestic production.

4. THE ROLE OF NEW TECHNOLOGIES - AN OVERVIEW[1)]

The clothing industry has traditionally been characterized by low capital intensity and a slow rate of technical change. The basic technology has

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1) This section is mainly based on Rush and Soete (1984) and Rush and Hoffman (1987).

remained relatively simple and basically the same for a long period of time, and thus entry barriers to the industry have been very low. During the last 15 years or so, however, there have been many important innovations within certain stages of the production process. These innovations are largely based on advances in micro-electronics and offer in many cases the potential to substantially increase productivity. The effect of these innovations on overall productivity and total costs has, however, so far been limited, since they typically incorporate only a small fraction of the production process.

Table 5 presents major technological changes which occurred in the 1970s. Most of them are related to the pre-assembly stage of the production process. For instance, the activities of grading, marking and cutting have benefitted substantially from the use of computer-aided interactive graphics and numerically controlled machine tools. The use of computer-controlled cutting systems also makes possible the integration of the three pre-assembly activities and thus makes the traditional breakdown into design and manufacture obsolete. While the diffusion of computer-aided management planning and production control has so far been limited, there is great potential for increasing efficiency in these areas.

So far there have been no major technological breakthroughs in the sewing or assembly stage of production. This seems to be the key problem in increasing productivity in the clothing industry, since the machinist's wage accounts for about 80 per cent of total labour costs and 30-40 per cent of total costs. The assembly stage offers only limited possibilities for automation since it consists of a large number of different activities. According to some studies (see Kuosa (1985) p. 11) some 60 % of the machinist's time usage may consist of material

Table 5. Major Technology Changes in the World Apparel Industry in the 1970s.

Technology	Description	Diffusion
Electronic Computers	Computers are being used by management for sales analysis and forecasting, process inventory and workflow management.	More widespread use of computers expected. More software will become available for the product engineer, cut planning and production schedule creation. Will be linked to 'real time' applications.
Computer Aided Interactive Graphics	In the production process computer aided design equipment is being applied to grading and marking operations resulting in increased fabric utilisation.	The use of computers in pattern grading and marker making will continue to grow rapidly. Use of systems is likely to spread from large to medium size firms.
Numerically Controlled Cutting Devices	Numerical control equipment directs devices through their operations with improved product quality and higher cutting speed (linked to CAD).	Will continue to diffuse within those larger firms which are prepared to centralise cutting facilities.
Laser Cutting	Computer guided laser cutting system cuts single ply fabric at high speeds with high accuracy, reducing material losses.	Used to a very limited degree in cutting men's suits and interlinings. High capital costs and technical difficulties limiting cutting depth will restrict use until development of continuous spreading and cutting from roll.
Pre-programmed Dedicated Sewing Machines; Pre-programmed Convertible Units; Operator Programmable Sewing Machines	Automatically sews various components such as collars, cuffs and pockets. High productivity gains but limited to sub-assembly operations.	Diffusion limited primarily to large firms with long runs and stable fashions. Operator programmable units for more general purpose use will increase flexibility and diffuse to larger firms.

Source: Rush and Soete (1984).

handling. In the sewing process itself, technical changes have so far been only incremental advances over previous vintages. The main changes since the 1930s have been the doubling or trebling of stitching speeds, the specialization of machines to match sub-assembly operations, and the addition of work aids to assist in sewing, removing and stacking the workpiece.

The development of new technologies in the clothing industry is especially attractive for high-wage countries, and several large research programs have been established, e.g. in the USA, Japan and the industrialized countries of Western Europe. A common feature of these programs is that one of their most important aims is to reduce the amount of labour needed in the production process by some 40-50 per cent. This is generally considered as the threshold value of changes required in order to ensure competitiveness of the clothing industries of industrialized countries in relation to low-wage countries. For example, in Japan a large program of some 70 mill. USD coordinated by the MITI (Ministry of trade and industry) was started in 1982 and it aims at achieving by 1990 a pilot system of clothing production where the need for labour input would be 50 % lower than in the factories currently in use (see Kuosa (1985)).

The Japanese project called "Research and Development of an Automated Sewing System" has several objectives, e.g. development of techniques for information coding and use of coded information in the material handling and sewing process, handling of limp fabrics, and development of system control techniques. A multi-function sewing system and related machine heads are also being developed for the application of flexible manufacturing. This system sews various types of parts on one machine using sewing heads and jigs which are automatically exchanged. In addition, the integration of individual human body measurement and automation techniques of pattern designing and sewing is aimed at in order to achieve a breakthrough of CAD/CAM systems (see Aisaka (1987)).

According to some estimates, however, an economically feasible and flexible fully automated production system for clothes will not be

possible within the next 20 years. The current applications of new technology have been estimated to make annual productivity increases of 2-4 % possible up to the middle of the 1990s. The new applications of next decade would increase productivity annually by 5-8 %. This also means a widening gap in competitiveness between firms using the newest technology and those that do not, and with increasing investment needs this will probably increase the share of large scale production in the industry structure (see Kuosa (1985), pp. 36-7, and Wyatt (1987)).

5. THE DIFFUSION OF NEW TECHNOLOGIES IN THE FINNISH CLOTHING INDUSTRY

5.1. An overall picture: Trends in capital accumulation and productivity

Reflecting the nature of the clothing technology, the capital intensity in the industry is clearly lower than in manufacturing on average (Figure 4). The capital/labour ratio (measured as net capital stock/hours worked) in Finnish apparel manufacturing is about one-third of the corresponding ratio in total manufacturing. That seems to be somewhat higher than, for example, in the U.K., where the capital/labour ratio in clothing (and leather) was about 20-25 % of that in total manufacturing in the beginning of 1980s.[1)]

Furthermore the capital/labour ratio in the Finnish clothing industry grew quite rapidly until 1984, i.e. more than doubled from the mid-1970s, whereas the growth in total manufacturing was less than 50 %

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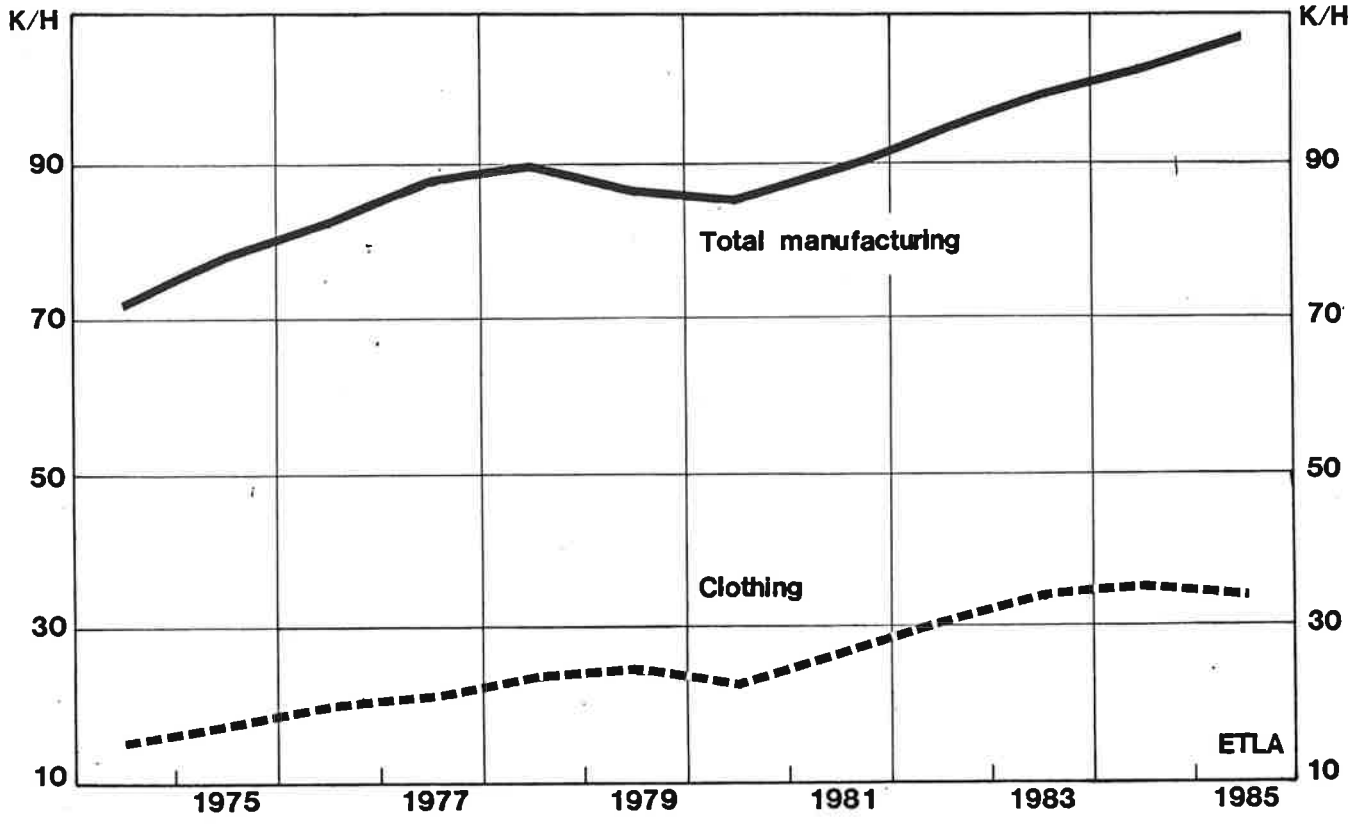
1) See Rush-Soete (1984) p. 205.

Figure 4. Capital/labour ratio in the clothing industry and total manufacturing, 1974-85.



during the same period (see Figure 4). That implies an intensive substitution of capital for labour. However, this development seems to have stagnated since during the last couple of years the capital/labour ratio has been fairly stable. That is a consequence of the decreasing investment activity: the investment ratio (fixed capital formation/ value added) in the clothing industry has dropped to a half of the level in the mid-1970s (Figure 5).

At the same time the productivity performance of the clothing industry has weakened (Figure 6). Up to 1981 productivity (value added/hours worked) increased approximately at the same rate as in total manufacturing, but since then the growth has been less pronounced.

Figure 5. Investment ratio in the clothing industry and in total manufacturing, 1974-86, %

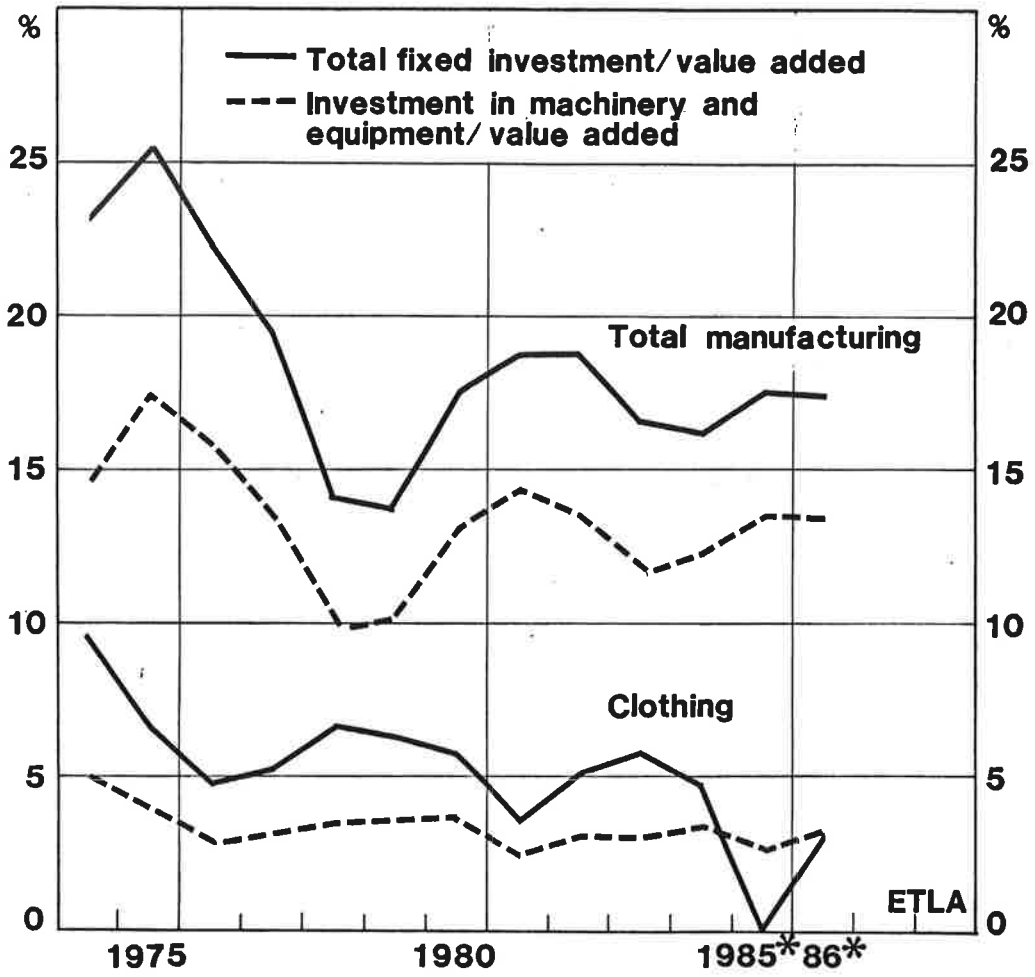
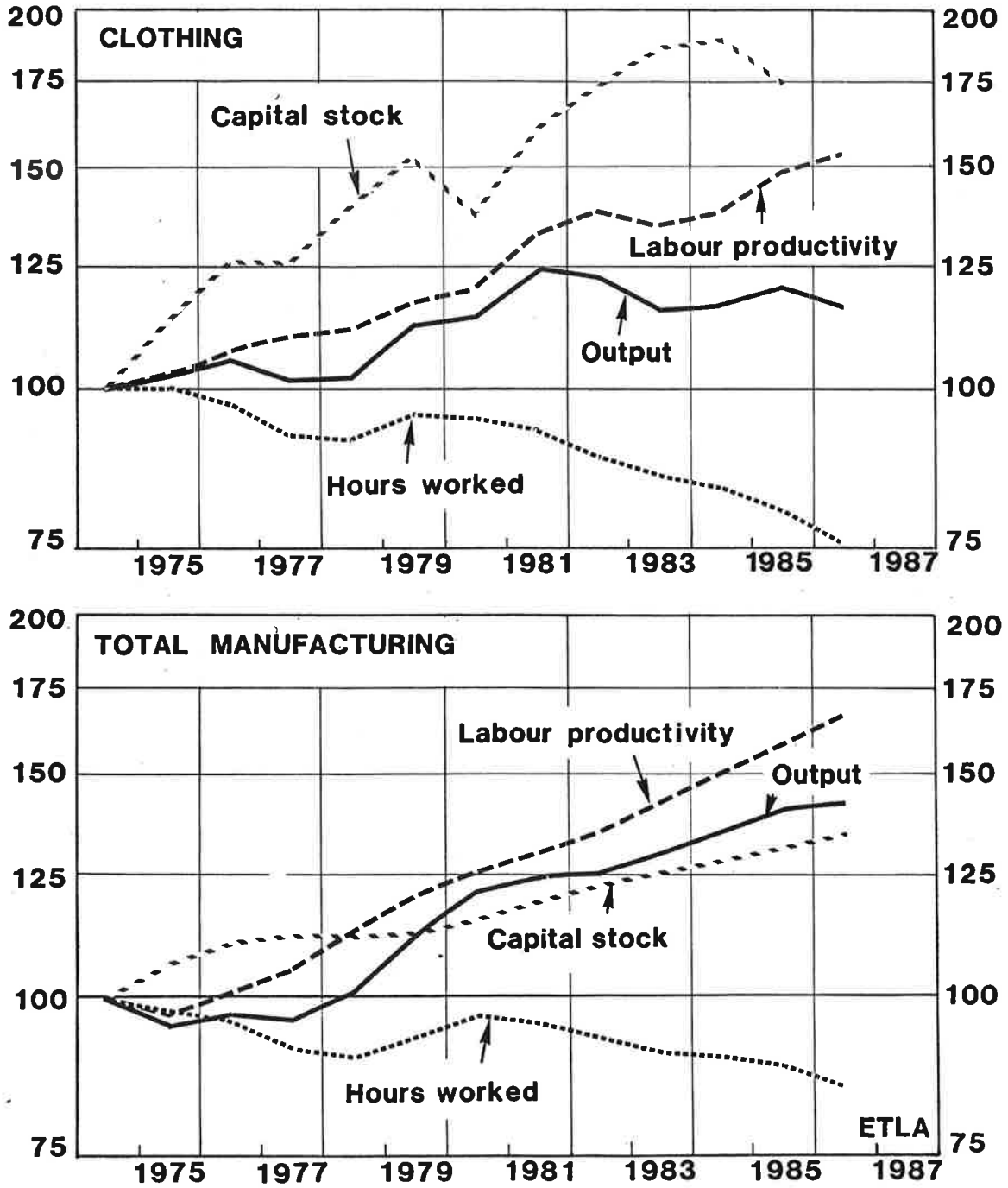


Figure 6. Productivity and volume of output, capital stock and labour input, in clothing industry and total manufacturing (1974=100)



5.2. Diffusion of new technologies

It is a widely held view that the diffusion of the new technologies has been rather fast in the Finnish clothing industry. Especially the larger companies lie in the forefront from the point of view of currently available techniques.[1] The main applications are in management planning and production control as well as in grading, marking and cutting. The three last-mentioned operations form the pre-assembly stage of production, where the information intensity is highest and hence the application of micro electronics most obvious. In larger companies marking and grading have been integrated into one phase by introducing computer-aided interactive graphics.

Table 6. Diffusion of computer and microprocessor control in Finnish clothing industry in 1985 (Based on a sample of 104 firms).

Area of application	% of companies	
	In use	Planning to use in the near future
A Management planning	17.3	2.9
B Production control (incl. A)	42.3	3.8
C On-line follow-up of production	1.0	3.8
D CAD/CAM		
- design	9.7	2.9
- marking and grading	24.0	3.8
- cutting	5.8	2.9
E Conveyors	2.9	4.8
F Machines control	57.7	..
G Other	42.3	..

Source: Honkala (1986).

1) See, e.g., Honkala (1986) which compiles data on about 100 Finnish clothing firms.

Table 6, which is based on a survey by Honkala (1986), gives an overview of the microelectronics applications in the Finnish clothing industry in the mid-80s. Hardware as well as software are mainly imported. However, some of the larger companies have invested to quite a large extent in software development. Nearly all production control systems are firm specific applications, i.e. taylor-made solutions for various kinds of production processes. There is a growing number of companies providing ADP services, especially for smaller clothing firms.

In the sewing process micro electronically controlled machines are used to carry out small parts assembly (joining sleeves, collars, etc.) in some firms making long production runs. However, nearly all new sewing machines perform some smaller operations (thread cutting, finishing operations, etc.) based on microprocessor control.[1)]

The general picture of the Finnish clothing industry is that the potential gains from the introduction of new technologies have led to quite a rapid rate of diffusion. Nevertheless, the high capital costs associated with these technologies have restricted the diffusion mainly to larger companies.

6. SUMMARY AND MAIN FINDINGS

In the beginning of the 1970s the textile and clothing industries in most industrial countries entered a historical transition phase:

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1) See Honkala (1986).

production, exports and especially employment began to decline and import penetration from developing countries accelerated. By the mid-80s the exports from developing market economies had reached a share of more than 50 % of the world trade of clothes and related products, while the corresponding share was only one-fifth in 1970. Low wages, relatively simple and easily transferable technologies created the comparative advantages which caused these changes. Economic policies in industrial countries responded with protectionistic measures which culminated in the MFA agreement in order to shelter their own production. This aim has so far been achieved to some extent, since more than two-thirds of global textile and clothing production is still held by advanced market economies.

The performance of different industrial countries has varied a lot. The Finnish clothing industry showed virtually uninterrupted growth up until 1982 due to increasing demand in major export markets in the Nordic countries and especially in the Soviet Union. The output volumes have, however, decreased rapidly after the peak years and are today some 15 % lower than in the early 1980s. At the same time as the Finnish clothing industry seems to have faced a similar kind of crisis as most industrial countries experienced 10-15 years earlier, the production of clothes in many other European countries has recovered, at least temporarily.

The new flexible technologies have recently been seen as a possible vehicle to reverse the declining trends that emerged in the 1970s. So far the applications of microelectronically controlled technologies have, to a great extent, concentrated on the pre-assembly phase of the clothing production and gains achieved in labour productivity have been only incremental as far as the whole production process is concerned.

The sewing process, which accounts for 70-80 % of total labour costs, has not yet been affected by real technical breakthroughs. The micro-electronics based innovations concern only small parts assembly or some smaller operations of the sewing machines.

Nevertheless, CAD and CAM during the pre-assembly have improved the competitive position of those typically large firms who have been able to shorten lead times and to flexibly alter the product mix and increase product differentiation.

The diffusion of the new technologies in the Finnish clothing industry has been quite rapid and at least the bigger companies are lying in the forefront of currently available technology. The quick application of technical advances has been a necessary but not sufficient condition for their success. There have been other factors at work as well, mainly the high quality of design, marketing and management. The Finnish firms are almost totally dependent on imported technology, which underlines the importance of the technology transfer mechanism and high level of education in the industry.

As stated above, the key problem in the future development of clothing technologies is the automation of the sewing process. It is a widely held view that when this becomes possible, it will provide the major breakhtrough of new technologies needed to ensure the competitiveness of the clothing industries of industrialized countries. The problem is essentially a question of overcoming the limpness of the material to be handled. There are at present several large-scale research projects in various countries trying to tackle this question, and the solutions are expected to be found in the foreseeable future, although not within

the next few years. The greatest expectations are associated with the Japanese program on developing an automated sewing system, and related projects are being carried out, for example, in the EC, in Sweden and in the U.S.

The adoption of new technologies in the clothing industry will have several implications for the characteristics of production, the competitive situation and the structure of the industry. New technologies will create possibilities for flexible production of more product varieties with shorter lead times than before, and for responding quickly to signals from the market place. There will probably also be changes in the international location of the industry. The new technologies are largely based on the idea of integration of the whole process of design and manufacture, and with the disappearing labour cost advantage of the developing countries a partial shift of clothing production back to the industrialized countries may be expected. On the other hand, the new technologies may also be adopted in the less developed countries, in which case the competitive situation will become even tighter than before. In addition the fairly large investment requirements will mean a diminishing number of firms, and larger ones on the average.[1)] The new competitive situation will also enhance the importance of both backward and forward integration of clothing firms in the production and distribution process.

To answer the basic question of this paper: the current trends in the Finnish clothing industry are likely to continue for the next 10-15 years. This means that output volume and employment will further de-

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1) See Wyatt (1987).

cline, import penetration will increase and the trade balance will turn into a deficit already in the near future. However, the industry will be affected in many ways by the introduction of the new technologies. Fast diffusion of new microelectronics applications is a necessary condition to slow down the worsening competitive position vis-à-vis developing countries. On the other hand, flexibility and quick response is particularly needed in the new market areas of Western Europe. During the adjustment period ahead a competitive edge can be created by new technologies, design, marketing and management skills. This implies, together with increasing investment requirements, that the structure of the industry will change in favour of larger companies, which are probably more integrated into fabric production and/or into distribution and marketing networks.

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