

Changes in Spatial Relations between Fibres Production and Textile Industry in the World

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The textile industry, treated not only as manufacturing of textiles, but in a larger sense, can be considered a kind of a system. In the scale of a country it consists of some related elements; the production of textile goods is equal to the production of raw materials plus the balance of foreign trade of fibres on one side, and on the other side it equals the consumption of textile goods plus the balance of foreign trade in textiles⁽¹⁾.

Therefore discussing changes in the spatial structure (understood as the spatial distribution of components of a system, and the relations between these elements which are characteristic of this system as a whole) of the textile industry in the world the analysis can be based on the aboved mentioned system.

This system can be divided into two sub-systems: one connected with raw materials, which can be called «the supply system», and the other connected with consumption, which can be called «the demand system».

The purpose of this paper is presenting a general approach to the problem of changes in the spatial structure of the supply system the elements of which form the following relation: $FP + FT = M$, where

FP - production of raw materials (fibres)

FT - balance of foreign trade in raw materials (fibres)

M - production of textiles (mill consumption of fibres)

In order to achieve comparability between the analysed elements and in the scale of the whole world, the volume of the fibres production and foreign trade were expressed by physical measurement units (units of weight), whereas the volume of the production of textiles was expressed by the mill consumption

of fibres (also in units of weight). The spatial range of the analysis covers the whole world, and the basic spatial unit is a country, but only these spatial units have been treated separately which played an important role in the world textile production (i.e. 69 countries; the rest of the world was regarded as one unit). The time range covers the years 1964-1974, i.e. the period for which uniform statistical data are available in the FAO publication «Per Caput Fibre Consumption», the data being the basis for all further analyses. Apart from the textile industry as a whole the different textile raw material branches have been discussed separately because of their specific character as far as location and international division of labour is concerned.

Shifts in the spatial distribution of the fibres production and the textile industry can be well illustrated by means of changes of different spatial units' shares in the world production. The coefficient of redistribution⁽²⁾ is a synthetic index of changes in the distribution of a phenomenon, whereas the coefficient of geographical coextension⁽³⁾ makes it possible to compare the spatial distribution of two different phenomena (also at different points of time). This type of analysis, though, does not allow for complex presentation of shifts taking place in the spatial structure of the system. The transformation will be described more precisely as a result of distinguishing different types of countries according to a different character of changes, taking into account all elements of the supply system. The situation of each country was considered individually, to present then some more general conclusions.

A typology of spatial units presented below takes into consideration the characterization of occurring transformations from the point of view of changes in the share in the world production of raw materials of textile goods and relative improvement or worsening of the foreign trade balance⁽⁴⁾. Such an approach determines adopting the result of subtracting the share of a given country in the world production of fibres from its share in the world production of textile goods as the measure of the balance of exchange. Examining changes in all the three elements in each spatial unit under study will make it possible to include a given unit into one of the distinguished types. This in turn will allow to point out certain tendencies of transformations in the spatial structure of the supply system.

In order to simplify further considerations, let us assume that:

M_0 - the share of a country in the world production of textile goods in the initial year

M_1 - the share of a country in the world production of textile goods in the final year

FP_0 - the share of a country in the world production of fibres in the initial year

FP_1 - the share of a country in the world production of fibres in the final year

$$\Delta M = M_1 - M_0 \qquad \Delta FP = FP_1 - FP_0$$

$FT_0 = FP_0 - M_0$ - the balance of the foreign trade in fibres in the initial year

$FT_1 = FP_1 - M_1$ - the balance of the foreign trade in fibres in the final year

$$\text{so, } \Delta FT = FT_1 - FT_0 \rightarrow \Delta FT = FP_1 - M_1 - FP_0 - M_0$$

$\rightarrow \Delta FT = \Delta FP - \Delta M$, which means that the change in so expressed foreign trade balance equals the difference between the size of the change in the share of a given unit in the world production of raw materials and the size of the change of its share in the world production of textiles.

The following changes may take place in textile industry of different countries in the investigated supply system:

— in the field of the fibres or textile goods production:

a) relative growth in the production, i.e. increasing of the share of a country in the world production ($FP_1 > FP_0$ or $M_1 > M_0$)

b) relative decline in the production, i.e. decreasing the share of a country in the world production ($FP_1 < FP_0$ or $M_1 < M_0$)

— in the field of foreign trade in raw materials:

a) improvement of foreign trade balance, i.e. more rapid increase or slower decrease of the share of a country in the world production in the case of raw materials than in the case of textile goods ($FT_1 > FT_0 \rightarrow \Delta FP > \Delta M$); the improvement may consist in: either (1) increasing the foreign trade surplus ($FT_1, FT_0 > 0$) or (2) decreasing the foreign trade deficit ($FT_1, FT_0 < 0$)

b) worsening of foreign trade balance, i.e. more rapid growth or slower decrease of the share of a country in the world production in the case of textile goods than in the case of raw materials ($FT_1 < FT_0 \rightarrow \Delta FP < \Delta M$); the worsening may consist in either

(1) decreasing the foreign trade surplus ($FT_1, FT_0 > 0$), or

(2) increasing the foreign trade deficit ($FT_1, FT_0 < 0$).

From the point of view of the geographical coextension of raw materials production and their manufacturing, the decrease of surplus or the deficit means in the case of a given unit approximation of these two elements (↓), whereas the increase of the surplus or deficit means their divergence (↑).

Assuming that in the spatial unit there existed both fibres production and their manufacturing which have changed, several types of transformation in the spatial structure of the supply system can be distinguished (see fig. 1). The twelve basic theoretical types ($A_{il}, A_{el}, B_{el}, B_{il}, C_{el}, C_{il}, D_{il}, D_{el}, E_{il}, E_{el}, F_{el}, F_{il}$) do not exhaust all possible combinations of changes in this system.

In order not to complicate this division, a reservation has been made in the case when a given country had transformed during the period under study from a net importer into an exporter or vice versa, so that:

if $(FT_1 < 0) > (FT_0 > 0)$ it is a type with the foreign trade deficit (d)
 $(FT_1 > 0) < (FT_0 < 0)$

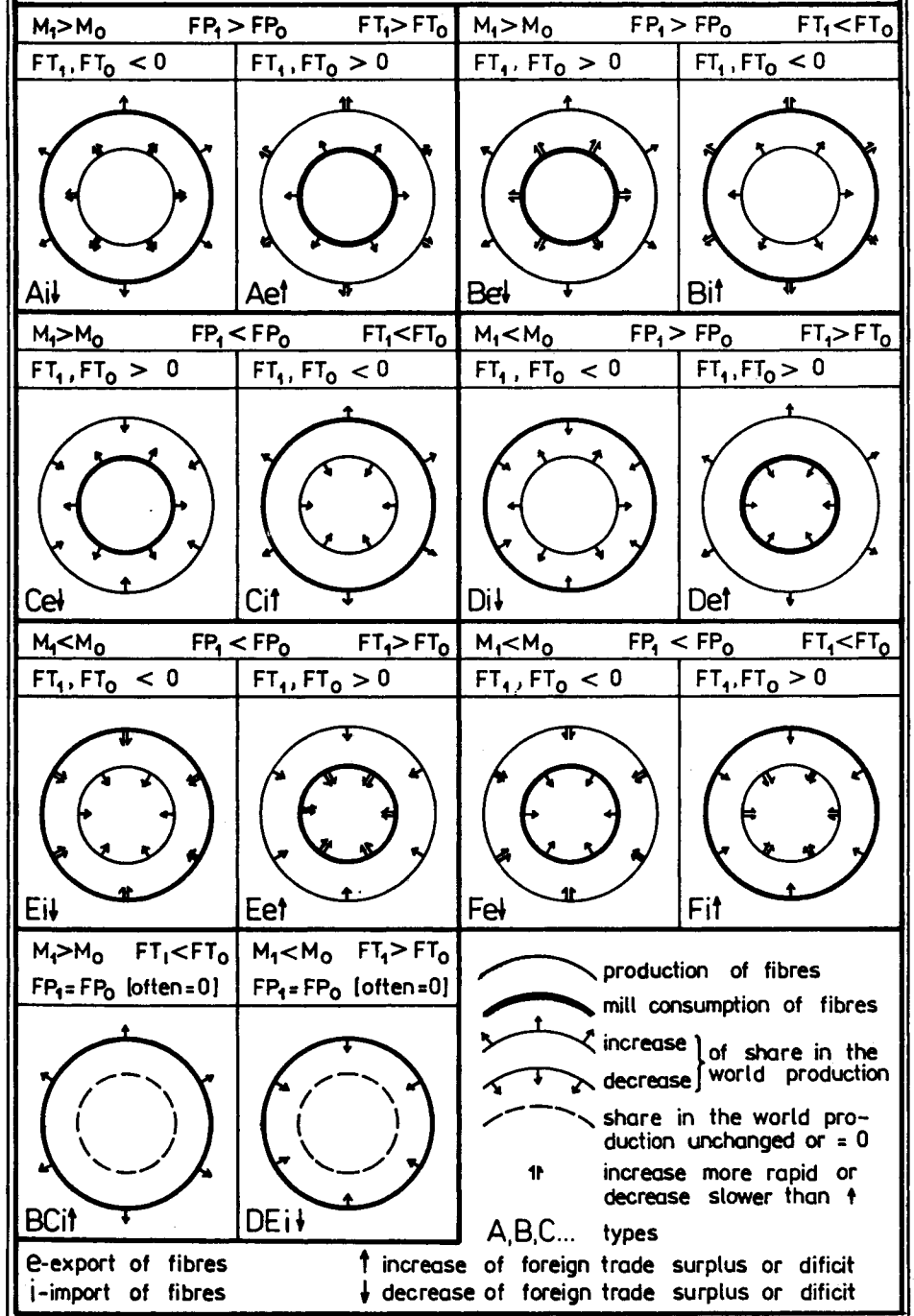
if $(FT_1 < 0) < (FT_0 > 0)$ it is a type with the foreign trade surplus (e)
 $(FT_1 > 0) > (FT_0 < 0)$

Thus, whether a given country which had changed from an importer into an exporter, and vice versa, will be included in the group of net importers or exporters depends upon the greater absolute value of so expressed foreign trade balance in one of the two examined points of time.

Apart from the above presented basic theoretical solutions some other types could be distinguished when one (or more) of the elements of the system did not change or simply did not exist, but they would be only modifications of one of the presented types. Since the number of such modifications could be quite great, and the majority of them do not occur in reality, only two of them (BC_{il}, DE_{il}) have been additionally taken into consideration.

The changes taking place in the production, foreign trade and processing of fibres have been examined in all investigated spatial units. On this basis coun-

Fig.1 TYPES OF CHANGES IN „THE SUPPLY SYSTEM“ OF TEXTILE INDUSTRY
- PRODUCTION AND MILL CONSUMPTION OF FIBRES



tries were included in different types (cf. fig. 2-7). The above presented method makes it possible to point out the main directions of changes in the spatial structure of the supply system.

The scale of shifts in production of fibres and textile industry in the world in the sixties and seventies is illustrated by the values of the coefficient of redistribution shown in table 1.

TABLE 1.
Coefficient of redistribution of the production and processing of fibres in the world (1964-1974)

Branch	Productions of fibres	Processing of fibres
cotton	0,183	0,155
wool	0,080	0,206
flax	0,171	0,173
artificial fibres	0,170	0,161
synthetic fibres	0,148	0,181
TOTAL	0,111	0,099

The scale of the locational change of both elements was similar and, viewing all the branches together, relatively small. However, there are considerable differences between different branches. While in the field of raw materials production the greatest shifts took place in the distribution of cotton growing, and the smallest —in the production of wool and synthetic fibres, the situation in the manufacturing of textile goods was quite the reverse— the spatial distribution of the cotton processing was the most stable, whereas the greatest shifts took place in the wool and synthetic fibres branche. It should be stressed that those changes, both in the case of the production of fibres and their processing, resulted in a smaller degree of spatial concentration in all branches (this process affected mostly the synthetic fibres branch, whereas the flax branch was an exception).

The spatial divergence of the fibres production and their processing in the world, quite considerable at the beginning of the nineteen sixties, decreased throughout the period under study. The different branches, though, differ widely also in this respect (cf. table 2).

TABLE 2.
Coefficients of geographical coextension of fibres production and processing in the world (1964-1974)

Branch	1964	1974
cotton	0,332	0,274
wool	0,564	0,513
flax	0,180	0,277
artificial fibres	0,145	0,134
synthetic fibres	0,094	0,142
TOTAL	0,229	0,151

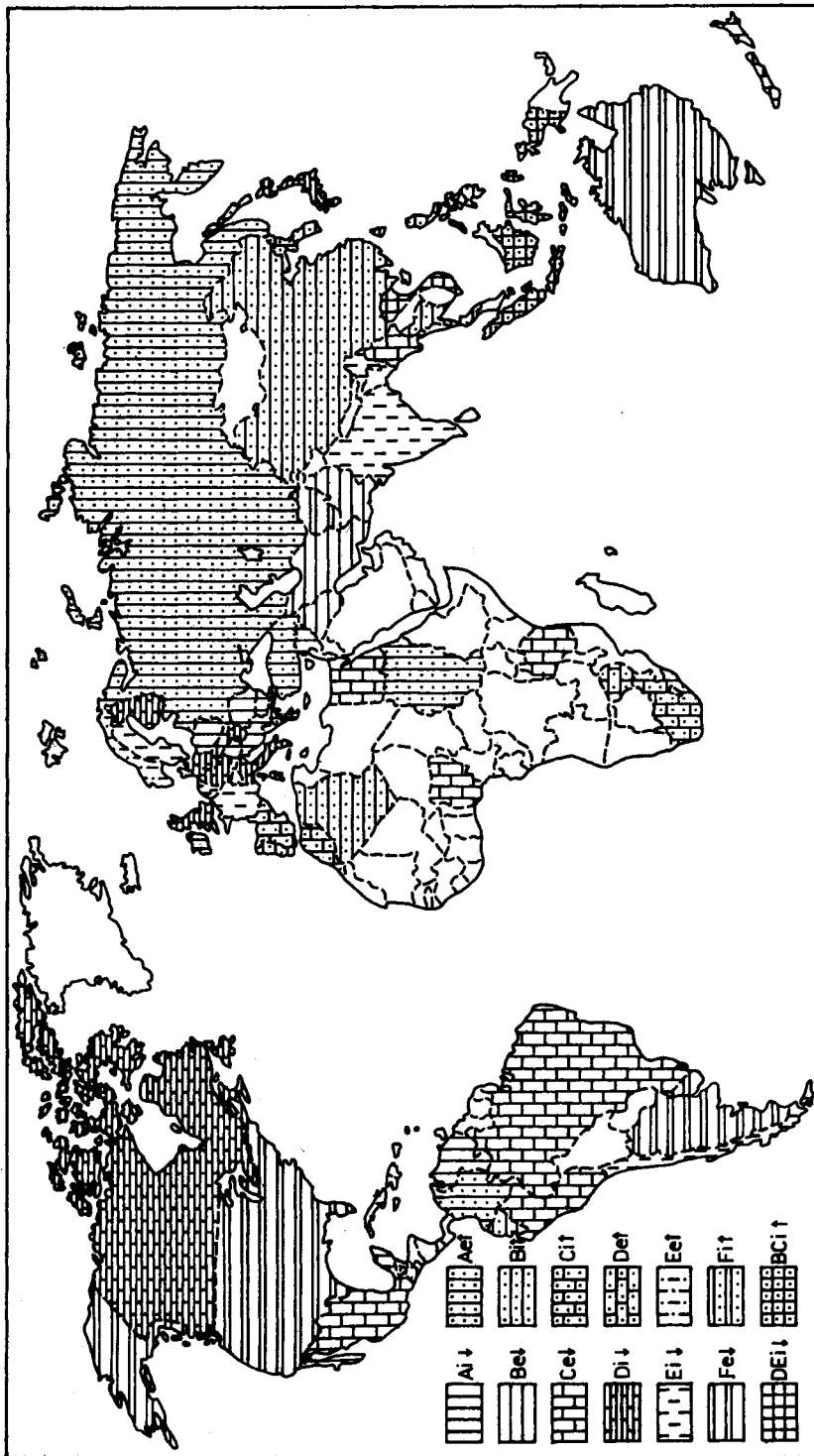


Fig.2 SPATIAL DISTRIBUTION OF THE TYPES OF CHANGES IN ALL BRANCHES [PRODUCTION AND MILL CONSUMPTION OF FIBRES]

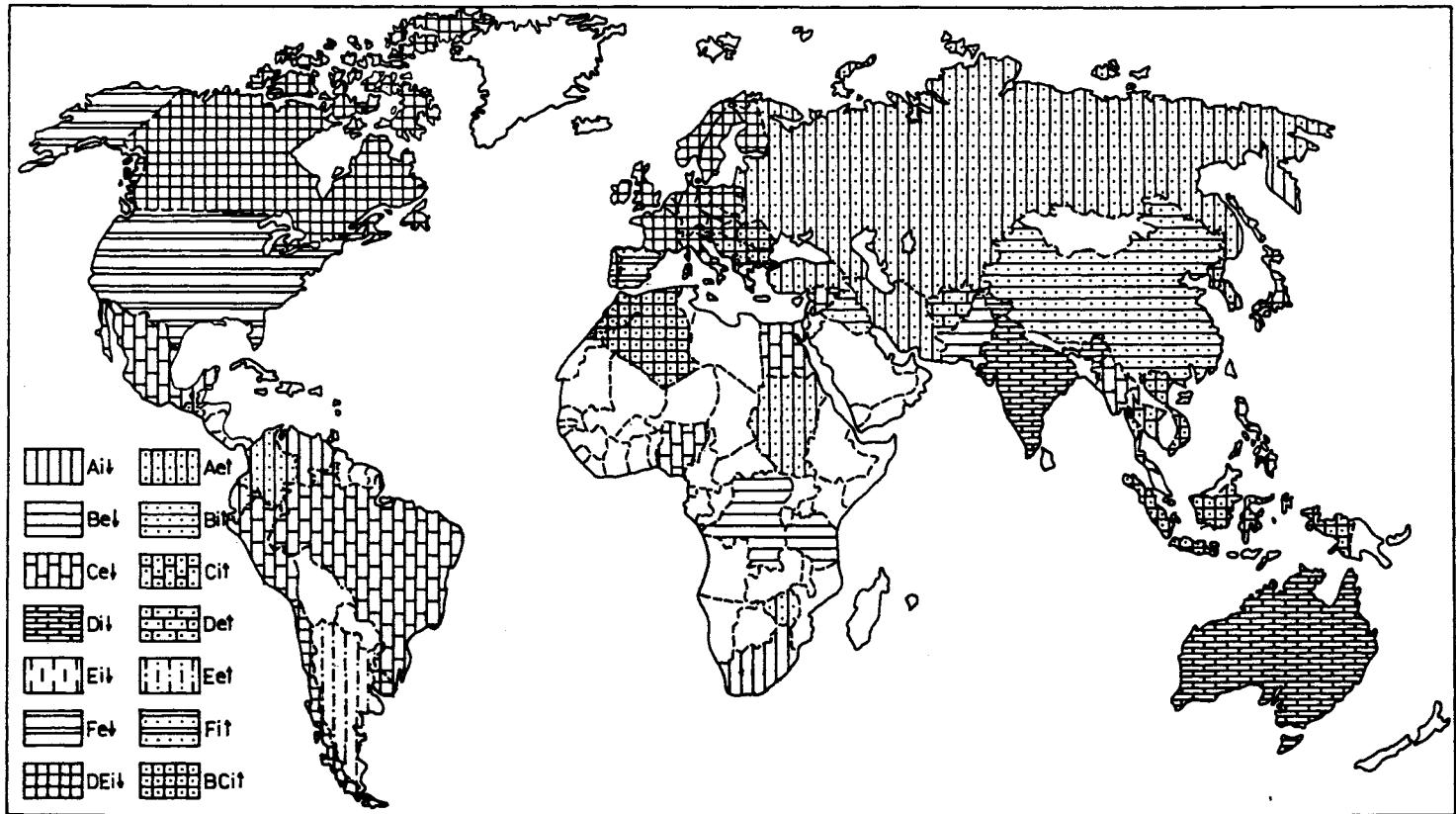


Fig3 SPATIAL DISTRIBUTION OF THE TYPES OF CHANGES IN THE COTTON BRANCH [PRODUCTION AND MILL CONSUMPTION OF COTTON]

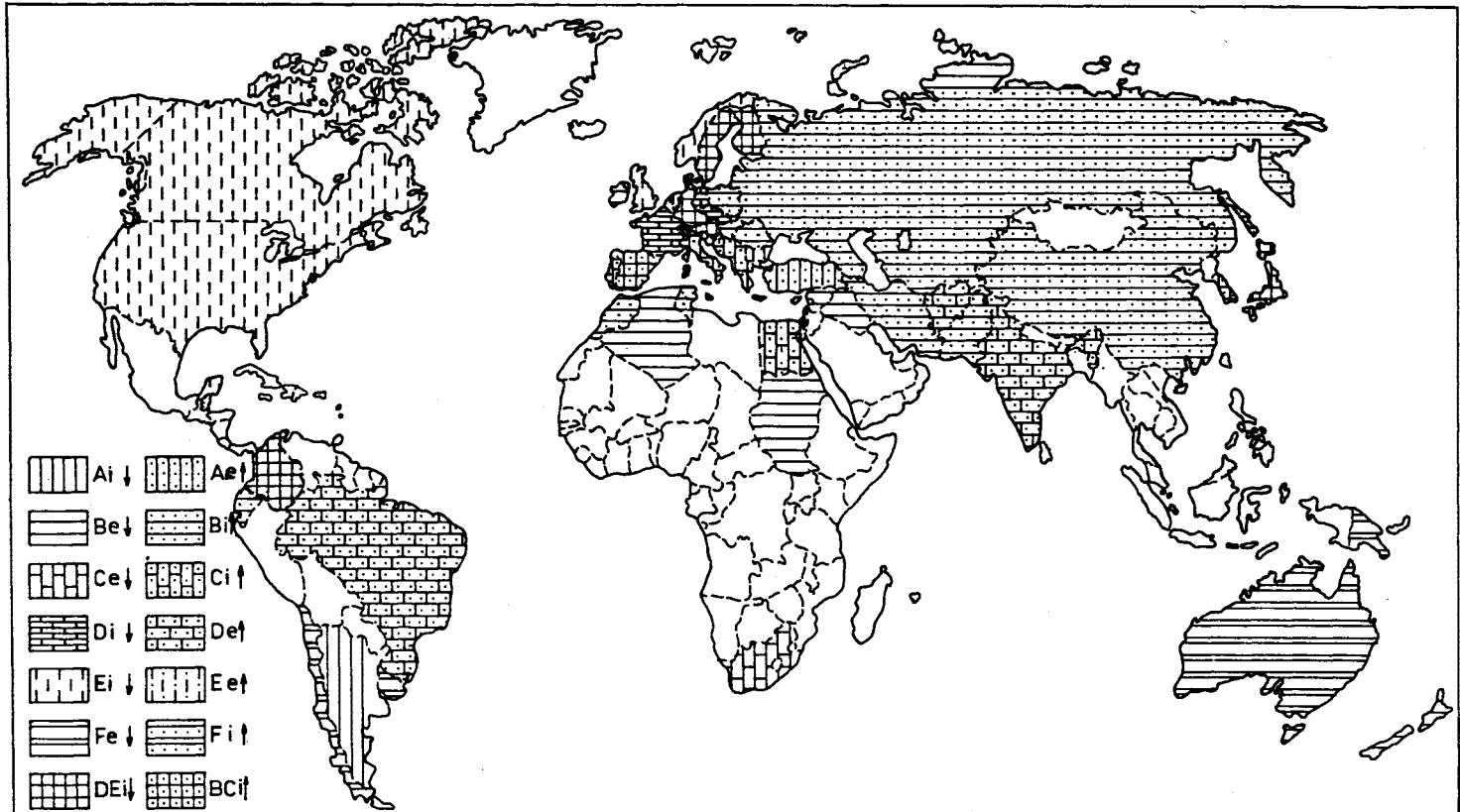


Fig. 4 SPATIAL DISTRIBUTION OF THE TYPES OF CHANGES IN THE WOOL BRANCH (PRODUCTION AND MILL CONSUMPTION OF WOOL).



Fig.5 SPATIAL DISTRIBUTION OF THE TYPES OF CHANGES IN THE FLAX BRANCH [PRODUCTION AND MILL CONSUMPTION OF FLAX]



Fig.6 SPATIAL DISTRIBUTION OF THE TYPES OF CHANGES IN THE ARTIFICIAL FIBRES BRANCH [PRODUCTION AND MILL CONSUMPTION OF ARTIFICIAL FIBRES].

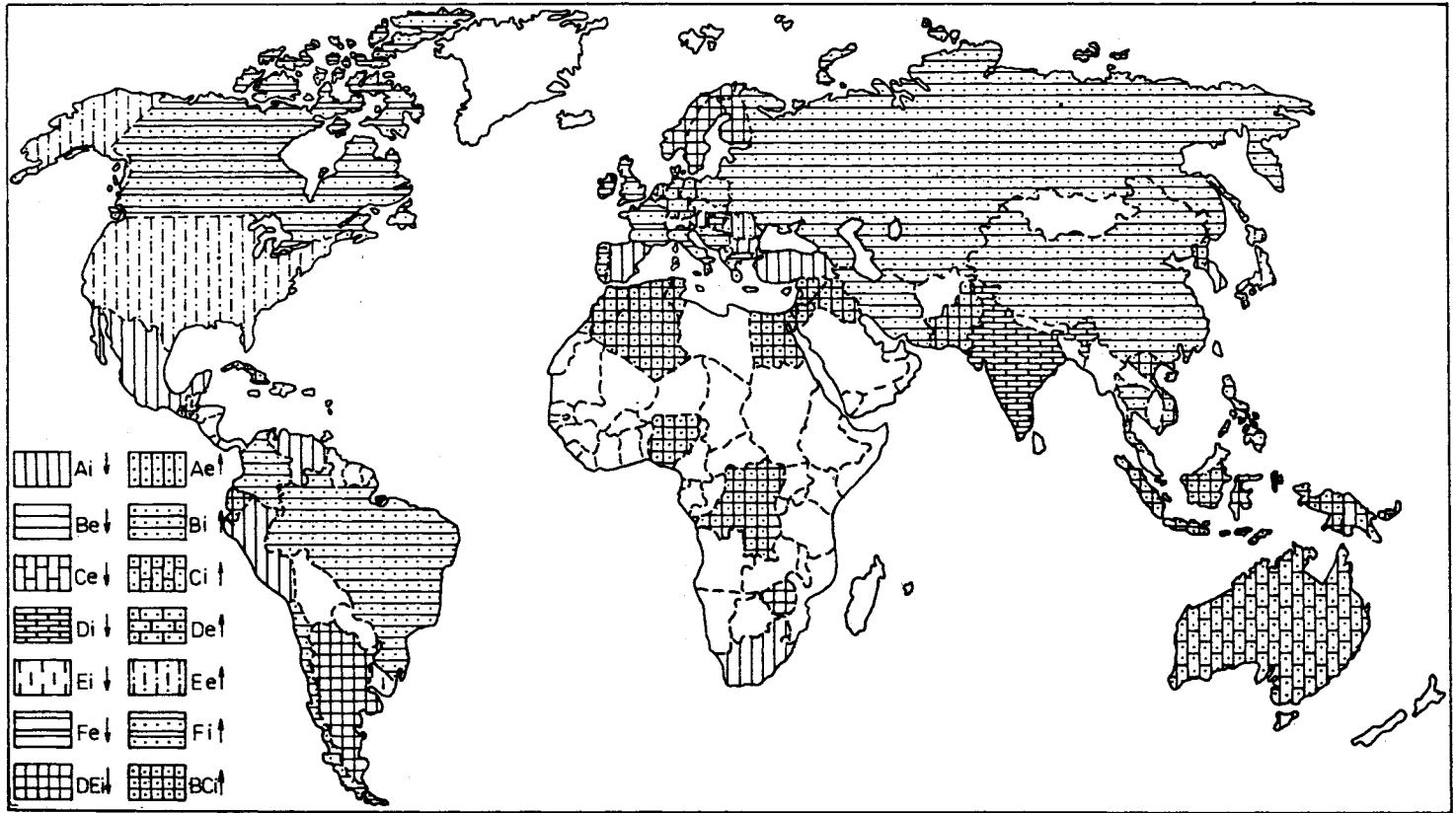


Fig.7 SPATIAL DISTRIBUTION OF THE TYPES OF CHANGES IN THE SYNTHETIC FIBRES BRANCH (PRODUCTION AND MILL CONSUMPTION OF SYNTHETIC FIBRES).

In the initial period the spatial relations between the production of raw materials and their processing were very strong in the man-made fibres branches especially in the synthetic fibres (concentration in the industrialized countries), but much weaker in the natural fibres branches, mainly cotton and wool — the fibres which to a high degree participated in international trade. In the sixties-seventies took place considerable approximation of the production and processing of cotton, wool and artificial fibres, and divergence in the synthetics and flax branch.

Greater proximity resulted mainly from the decrease of the textile raw materials imports to well developed and highly industrialized countries, and the decrease of export from undeveloped countries. This tendency was hampered by the development of the textile industry on the basis of the increase of import of some fibres in many rapidly developing countries of the Third World.

The analysis of figures 2-7 makes it possible to draw some general conclusions and point out main directions of changes in the spatial structure of the supply system. The tendencies of these transformations were as follows:

— Stunting the development⁽⁵⁾ of the textile manufacturing using fibres of foreign growth, which afforded possibilities for decreasing the import of fibres. This type of changes was characteristic of the developed and highly industrialized countries which reduced the production of textile goods especially in two branches: cotton and wool. This tendency was much weaker in the flax branch (many of industrialized countries, mainly in Europe, were quite important producers and exporters of the fibre, e.g. Holland, France, of Belgium), and also in the artificial fibres (some countries of the Third World), and in the synthetic fibres branch (especially the Scandinavian countries).

— Development of the textile industry with simultaneous reduction of the export of fibres and processing them on a larger scale at home. This tendency occurred only in the cotton and wool branch in many Third World countries being important producers of fibres (among others: Brazil, Mexico, Egypt, Pakistan, Greece and Tanzania — cotton; e.g. South-African Republic, Argentina, Pakistan, Syria, Maroc — wool).

— Rapid growth of the home base of man-made fibres, which made it possible, with simultaneous reduction of their import, to meet the growing demand for raw materials of the rapidly developing textile industry. This tendency appeared in those Third World countries which had fairly well developed industry, especially the textile industry (among others: Mexico, Turkey, South Korea — synthetic fibres branch; part of the CMEA countries, China, India, Iraq, Pakistan — artificial fibres branch).

— Development of the textile industry basing on growing import of fibres. This tendency appeared in all branches and in various countries, mostly undeveloped. It was the strongest in the man-made fibres branches, and was characteristic (especially in the case of synthetic fibres), of many countries of the Third World and the centrally planned ones (except for the most expansive in the world textile industry, which quickly developed the production of fibres at home). Some of the countries undertaking the production of man-made fibres were not yet able to meet quickly growing needs of the textile industry, and many of them did not undertake this production. In the natural fibres branches this tendency could be noticed only in specific groups of countries. In the

case of cotton they were the dynamically developing countries of the South-East Asia, which had not their own raw materials base (South Korea, Hong Kong, Taiwan, Indonesia, and Thailand), the centrally planned countries (Bulgaria, Romania, Yugoslavia, China), and Portugal. In the wool branch they were mostly the better developed countries of West and East Europe (Italy, Spain, Poland, Yugoslavia, and the USSR), China, and the countries of the Third World specializing in the textile manufacturing (South Korea, Hong Kong, and Egypt). In the flax industry this tendency appeared mainly in the European countries (among others the GDR, Poland, Holland, Portugal, Spain, Italy), and in South Korea.

— Rapid development of the fibres production which not only covered the demand of the dynamically developing textile manufacturing, but also made increasing the export of raw materials possible. This tendency appeared in the cotton branch (several big providers of raw materials, mainly in the Third World: Iran, Turkey, Sudan, Columbia, and the USSR), and in the flax branch (Egypt, Romania, and the USSR which almost completely dominated the production of this fibre).

Doubtless, the most characteristic and quite different were changes in two main textile branches: the cotton branch, where generally the region of the textile goods production approximated the raw materials areas, and the synthetic fibres branch, where the fibres were supplied by the highly developed countries, whereas they were processed on larger, and larger scale in the Third World countries, which resulted in the increase of the international trade in these fibres.

- (1) Such expression of the relations is a simplification, because changes in the size of stocks in the given period of time have not been taken into account, but, being relatively slight, these changes had little significance and could be omitted.
- (2) The coefficient of redistribution illustrates the size of changes in the spatial distribution of a phenomenon in a given period. In order to obtain this coefficient it is necessary to: a) subtract the shares in per cent of particular spatial units in a given phenomenon in the initial period from respective shares in the final period, b) sum up all positive (or negative) differences, c) divide by 100 the sums of positive (or negative) differences. The coefficient of redistribution can range between 0 and 1. 0 means no shifts in the spatial distribution of the phenomenon, whereas 1 means complete dislocation.
- (3) The coefficient of geographical coextension allows to measure the proximity of two phenomena. This coefficient is obtained by: a) subtracting shares in per cent of particular spatial units in one phenomena from respective shares in the other, b) summing up all positive (or negative) differences, c) dividing by 100 the sum of positive (or negative) differences. This coefficient may range from 0 to 1; 0 means that the spatial distribution of both phenomena was identical, while 1 means that it was quite different.
- (4) In order to avoid long and troublesome terms, certain simplifications have been used in the further part of the text. The term «growth/decline/of production» is used for increasing (or decreasing) the share of a country in the world production although in reality the absolute value of the production did not necessarily increase (or decrease).
- (5) The term «stunting the development» means in this case the decrease of the share of a country in the world production whereas the term «rapid development» —the increase of the world production.

Els canvis de les relacions espacials entre la producció de fibres i la indústria tèxtil en el món

La finalitat principal d'aquest article és presentar els canvis ocorreguts en l'estructura espacial del sistema de les matèries primeres de la indústria tèxtil en el món durant els anys seixanta i setanta. Aquest sistema engloba tres elements: la producció de les fibres i el comerç internacional que hi està lligat i també la producció dels tèxtils (que s'expressa pel consum de fibres en les empreses industrials). En aquesta anàlisi hom ha emprat mesures estadístiques senzilles com, per exemple, el coeficient de la redistribució o el coeficient de l'associació geogràfica i després hom ha elaborat la tipologia dels països que es distingeixen pel caràcter de la transformació dels elements del sistema.

Pel que fa referència a la producció de matèries primeres, els canvis més grans s'han experimentat en la distribució espacial de la producció del cotó, i els més petits en la producció de la llana i de les fibres sintètiques; però si es tracta dels tèxtils la situació és ben diferent. La distribució espacial de la indústria cotonera es presenta com la més estable, mentre que els canvis més grans s'han experimentat en el ram de la llana i de les fibres sintètiques.

Hom ha definit cinc direccions fonamentals en les transformacions ocorregudes en l'estructura espacial del sistema de les matèries primeres. Les transformacions més característiques i més diferents han succeït en dues branques tèxtils fonamentals: en el ram del cotó on s'ha pogut remarcar que les regions productores dels productes s'apropaven a les fonts de matèries primeres i també en el ram de les fibres tèxtils sintètiques on s'ha remarcat que els subministradors de fibres són els països desenvolupats, mentre que la producció dels tèxtils es fa en països del Tercer Món, i en conseqüència aquestes fibres participaven cada vegada més al comerç internacional.

Les changements des relations spatiales entre la production des fibres et l'industrie textile dans le monde

Le but de cet article c'est la présentation des changements de la structure spatiale du système des matières premières de l'industrie textile dans le monde pendant des années soixantes—soixante-dixièmes. Ce système englobe trois éléments: la production des fibres et le commerce international lié avec elle et ensuite la production des textiles (qui s'exprime par la consommation des fibres dans les usines industrielles). Dans cette analyse on a utilisé les simples mesures statistiques comme le coefficient de la redistribution ou le coefficient de l'association géographique et ensuite on fait la typologie des pays que se distinguent par le caractère de la transformation des éléments du système.

Dans le domaine de la production des matières premières, les changements les plus grands ont eu lieu dans la distribution spatiale de la production du coton, et les plus petits dans la production de la laine et des fibres synthétiques; mais s'il s'agit des textiles la situation était tout à fait différente. La distribution spatiale de l'industrie cotonnière était la plus stable, tandis que dans les branches de la laine et des fibres synthétiques ont été les changements les plus grands.

On a distingué cinq directions fondamentales des transformations dans la structure spatiale du système des matières premières. Les transformations les plus caractéristiques et tout à fait différentes se sont faites dans deux branches textiles fondamentales: dans la branche du coton où on peut remarquer que les régions de production des produits se rapprochaient vers les sources des matières premières et aussi dans la branche des fibres synthétiques où on a remarqué que les fournisseurs des fibres c'étaient les pays développés, mais la production des textiles s'est faite dans les pays du Tiers Monde, et par la suite, ces fibres de plus en plus participaient dans le commerce international.