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COUNTRY-SPECIFIC DETERMINANTS OF TEXTILE INDUSTRY DEVELOPMENT IN POLAND: COMPARATIVE ANALYSIS OF THE YEARS 2007 AND 2017

M. Jabłońska[1],*, J. Stawska[2], D.I. Czechowska[2]

1 Department of Finance and Accounting SMEs, Institute of Finance, University of Łódź, 39 Rewolucji 1905 r. St., 90-214 Łódź, Poland
2 Department of Central Banking and Financial Intermediation, Institute of Finance, University of Łódź, 39 Rewolucji 1905 r. St., 90-214 Łódź, Poland
*Corresponding author. E-mail: malgorzata.jablonska@uni.lodz.pl

Abstract:

The textile industry is a significant sector of the Polish economy and is characterized by a strong potential. Its development can be ensured by activities in the areas of finance, technical infrastructure, environmental protection, and demographic conditions. The development of the textile sector is significantly affected by factors such as quality of commune and poviat roads, length of the sewerage network, expenditure on environmental protection, expenditures on innovative activity and on research and development, and costs related to employment and population of working age. The aim of this paper is to determine the attractiveness level of individual Polish regions for the development of the textile sector in relation to five microclimates, which somehow define the most important determinants of the development of this sector of the economy. In order to achieve this aim, the following research methods are used: presentation of statistical data and statistical methods of research. The authors test the research hypothesis that the growth potential of textile industry enterprises is the largest in the most prosperous provinces.

Keywords:

Attractiveness, textiles, industry, economics

1. Introduction

The textile sector in Poland comprises the manufacture of textiles, wearing apparel, and articles of fur skins. In addition to textile manufacture, the clothing and leather industries also belong to the textile industry [1]. The textile industry is of crucial importance for the economy of Poland as a great number of people find employment in this sector [2], it is a source of founding of new enterprises; moreover, it provides modern products, not only in the Polish market but also abroad. The textile sector enterprises can be divided into the following: manufacturers of clothing sector products; companies providing sewing services for well-known global brands: manufacturers of fabrics (cotton, linen, etc.); textile factories; importers of semi-finished and finished clothing products; shops and wholesalers selling clothes of various brands; franchising outlets, and online shops [3]. The textile, clothing, and leather industries have undergone structural changes not only in Poland but also in other countries of the European Union (EU). Under the influence of technological development, in combination with traditional advantages in terms of design and quality, new markets, such as sports and tourist apparel, luxury goods, or shoes, have emerged in consumer markets. The growing popularity of such consumer goods has created new opportunities in the manufacturing industry market. Hence, it is important to support new business concepts and related manufacturing technologies directed at creating products that are durable, compliant with users' needs, and based on product

projects in the textile sectors [4]. Therefore, it is important to consider which regions or provinces are characterized by the highest level of attractiveness for the development of the textile sector. Hence, the aim of this paper is to define the level of attractiveness of individual Polish regions for the development of the textile sector in relation to five microclimates, which somehow define the most important determinants of the development of this sector of the economy.

2. Experimental

The European Union is an important market for textiles and apparel in the world. The year 2009 was a time when the majority of European countries faced the economic crisis; turnover of the European textile industry at that time amounted to EUR 167 billion (in 2017, it was EUR 181 billion). Total employment in that industry in the EU-27 in 2009 amounted to >2 million and, in 2017 (EU-28), there was a decline to 1.69 million employees. Investments in the industries under study amounted to EUR 4.9 billion, both in 2009 and in 2017 in the EU countries. There were about 128,000 enterprises in the textile industry in the EU-27 in 2009 and about 176,000 companies (EU-28) in 2017. Exports in the textile industry from the EU-27 amounted to EUR 30.4 billion in 2009 and imports amounted to EUR 74.9 billion. In turn, in 2017, exports from the EU-28 were estimated to be EUR 47.9 billion and imports to the EU-28 were EUR 112.1 billion. The countries to which the biggest number

of textile products was exported from the EU in 2009 included the following: Switzerland, Russia, the USA and Turkey; and in 2017, the countries included Switzerland, the USA, Russia, China, and Hong Kong. On the other hand, the countries from which the biggest number of products was imported to the EU in 2009 included China, Turkey, Bangladesh, India, and Turkey, and in 2017, products were largely imported from China, Bangladesh, Turkey, India, Cambodia, and Pakistan [5, 6].

The textile industry is an important element of the economy in Poland, and due to its rapid development, it has a chance to become one of the main driving forces of the country's economic growth [7], in particular, through the development of small- and medium-sized enterprises (SMEs) – which are the main initiators of economic growth – creating jobs, providing employment opportunities, and contributing to large enterprises as suppliers of goods and services [8]. While looking for measures of its potential, the following ones have been selected based on, inter alia, availability of information: the level of production sold, financial results obtained, as well as the level of intensification of exports and imports. The production sold for the industry is presented in Figure 1 (statistical data for the years 2008–2017; the lack of complete data in 2007). While analyzing this information, it can be noticed that production sold by sectors shows the biggest values in the case of output of textile products. In 2008, this production amounted to PLN 8,090.2 million and, in 2017, to PLN 14,749.7 million. Manufacture of wearing apparel in 2008 amounted to PLN 9,527.5 million and, in 2017, to PLN 9,442.5 million. On the other hand, leather goods and related products amounted to PLN 3,298.9 million in 2008 and to PLN 5,549.5 million in 2017. There was a noticeable decline in sold production in the three sectors under study during the financial crisis in the years 2009 and 2010. It was only in 2011 that the rate of growth of sold production was significantly higher compared to that in 2010. In sum, there was a total increase in sold production in the textile sector from PLN 20,916 million in 2008 to PLN 29,742 million in 2017.

In the period between 2008 and 2016, exports of industrial goods (Figure 1) from the manufacturing sector of textile products, wearing apparel, as well as leather and related products developed rapidly. In 2008, exports of textile products amounted to PLN 5,572 million and, in 2017, to PLN 11,034 million. The growth in the wearing apparel sector was even higher: exports increased from PLN 8,123 million in 2008 to PLN 22,315 million in 2017. In the sector of leather and related products, the value of exports rose from PLN 2,051 million in 2008 to PLN 8,949 million in 2017. A significant increase in the rate of growth of exports of industrial goods can be noticed in 2010 compared to that in 2009, when economic downturn was experienced by many countries that imported these goods from Poland. Exports of products from the textile sector increased from PLN 15,746 million in 2008 to PLN 42.298 million in 2017.

In spite of the crisis, significant funds were still invested mainly in machines and devices in 2009. The collapse in demand in the EU market, the most important market for the Polish export, did not considerably affect the output in Poland. It is worth mentioning that the wearing apparel sector in Poland is the biggest export category due to the fact that the process of manufacture substantially involves modern technologies. Moreover, Poland is – because of the short distance to Western Europe and presence of a well-qualified workforce, along with advanced know-how – is a perfect place to locate the textile manufacturing sector. Therefore, there is a potential for the development and growth of exports, especially of fashionable high-quality products made of special modern fabrics characterized by a high level of creativity and addressed to selected groups of customers [1].

Among the imported industrial products (Figure 1), the highest value was achieved by products from the wearing apparel sector, which, in 2017, amounted to PLN 26,742 million, compared to PLN 8,142 million in 2008. The value of leather and related products rose considerably from PLN 4,482 million in 2008 to PLN 13,061 million in 2017. The value of products from the textile sector reached PLN 11,044 million in 2008 and PLN 17,049 million in 2017. In 2010, a significant growth of imports can be noticed in the sector of textile products, as well as for leather and related products, compared to the imports in 2009. In total, in 2008, imports of products in the textile sector
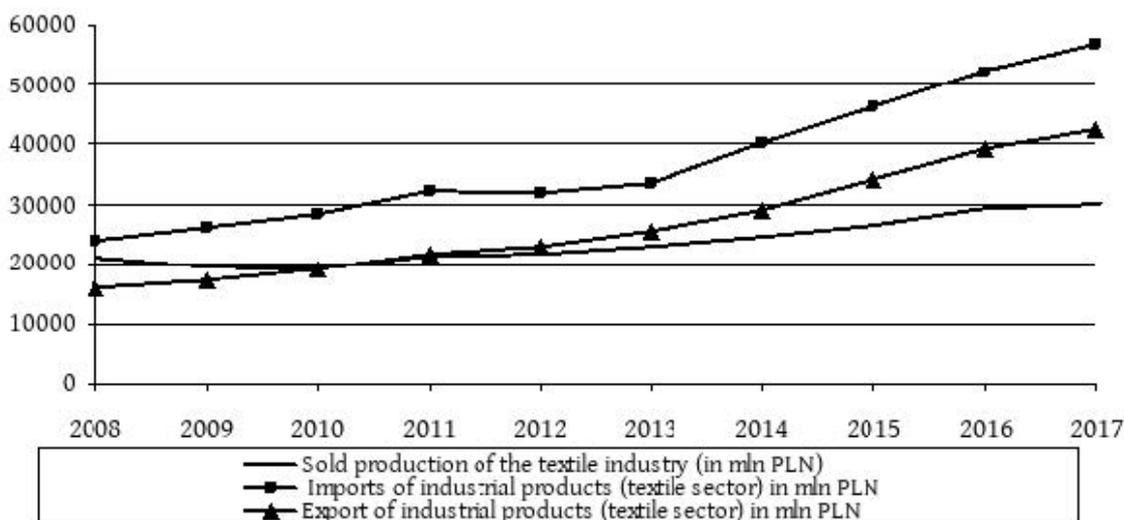

Figure 1. Characteristics of the textile sector in Poland (the sum of manufacture of textiles, manufacture of wearing apparel, and manufacture of leather and related products) – part 1. Source: Authors' own presentation based on previous research [9].

amounted to PLN 23,668 million in relation to PLN 56,852 million in 2017.

During the period of transformation when mass imports from China could be observed [10, 11], Polish companies and institutions turned to production and research activity, which enabled them to survive. Additionally, while using funds from the EU, the State, and their own financial resources, they invested in research and development (R&D) in the textile industry. For example, microspectrofluorimetry techniques were developed in laboratories to examine the structure of biomaterials to test modern "smart" fabrics and products for medicine. New circular knitting machines were used to manufacture swimwear or outfits for athletics. Special ironing lines were introduced for products made of fabrics such as klimeo, with thermoregulatory and self-smoothing properties. The innovative technology of digital printing for textiles made of cellulose fibers with excellent moisture-resistant properties was developed, and new delicate fabrics made of bamboo fibers and others began to be produced [12, 13].

In order to develop the textile industry, it is necessary to invest in new technologies, machines, and projects. Another argument in favor of investing in the textile industry is a growing demand for textiles, wearing apparel, and leather goods. The biggest investment outlays were noted in the period between 2008 and 2017 in the textile market (PLN 432.7 million in 2008 and PLN 791 million in 2017). Investment outlays on the production of leather goods and related products also increased (PLN 84.6 million in 2008 and PLN 109 million in 2017). On the other hand, investment outlays on manufacture of wearing apparel in the period under study decreased (PLN 301.9 million in 2008 and PLN 164.5 million in 2017). Compared to 2009, in 2010, the growth of investment outlays was noted only in the sector of leather and related products, as well as in the sector of textiles. In 2008, investment expenditure in the textile sector was recorded at PLN 819 million, while in 2017, it amounted to PLN 1,065 million (Figure 2; statistical data for 2008–2017, no complete data for 2007) [14].

While verifying the financial results of textile enterprises generated by the three described sectors (manufacture of textiles, manufacture of wearing apparel, and manufacture of leather and related products) between 2008 and 2017 (Figure 2), it can be noted that production of leather goods and related products developed very rapidly from the value of PLN 82.2 million in 2008 to PLN 273.6 million in 2017. In 2008, manufacture of textile products reached a very low level of PLN 6.3 million, yet, in 2009, it was already PLN 149.3 million and PLN 511 million in 2017. In the case of manufacture of wearing apparel, the growth between 2008 and 2017 was stable, starting from the value of PLN 189.4 million to PLN 305.5 million in 2017. The total net financial result of textile enterprises in 2008 was PLN 278 million, while in 2017, it was PLN 1,090 million [14].

It is worth emphasizing that expenditures for the textile sector affect the potential and attractiveness of this sector. There are obviously development opportunities for the textile-clothing industry if adequate financial resources are devoted to investments in research and on R&D equipment [15]. The expenditures on R&D activities and devices in the textile sector amounted to PLN 20 million [in 2008] and to PLN 33.2 million in 2017. Similarly, in the textile market, without outlays on activities in the area of product and process innovations, development problems may occur. Outlays on innovative activity increased in the textile sector from PLN 82 million in 2008 relative to PLN 227 million in 2017 [14].

2.1. Materials and methods

In order to determine and assess the attractiveness level of individual Polish regions for the development of the textile sector in relation to specific microclimates, which determine the development of this sector, the pseudo-single-feature indicator described in the literature on the subject was used. Turning to the construction of a pseudo-single-feature indicator determining the attractiveness of Polish voivodships in terms of creating optimal conditions for the development of enterprises in the textile sector, it should be mentioned that the research
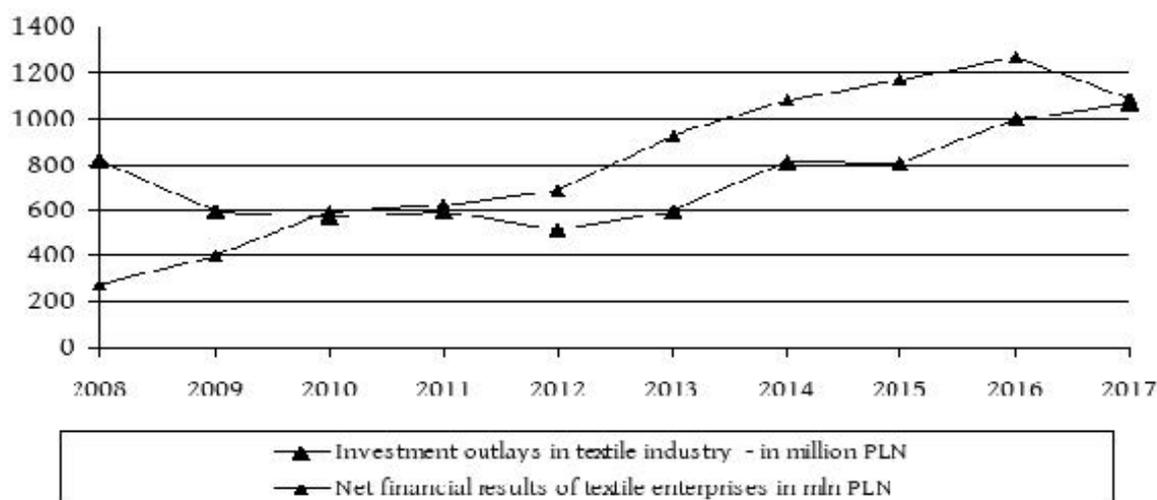

Figure 2. Characteristics of the textile sector in Poland (the sum of manufacture of textiles, manufacture of wearing apparel, and manufacture of leather and related products) – part 2. Source: Authors' own presentation based on previous research by Godlewska-Majkowska [14].

presented in this article was carried out in an analogous way to the study contained in Godlewska-Majkowska's book entitled, "*Atrakcyjność inwestycyjna polskich regionów. W poszukiwaniu nowych miar*" [Investment attractiveness of Polish regions. In search of new measures] [14]. The indicator used in the further part of the work was calculated using the weight-correlative method, which is most often used when examining the investment attractiveness of regions and voivodships. The indicator presented was designated as a weighted average of five microclimates, into which the variables best describing the investment climate in voivodships were grouped. Variables were adjusted to comparability using the unitarization method. It consists in dividing the value of a variable or its distance from one of the borders by the gap [9].

The following formulas were used for this purpose [16]:

- in the case of destimulants:

$$\frac{X_{maks} - X_i}{X_{maks} - X_{min}} \times 100\%$$

- in the case of stimulants:

$$\frac{X_i - X_{min}}{X_{maks} - X_{min}} \times 100\%$$

As a result of this operation, each of the variables has been standardized to values within the <0;1> range. In the case of positive variables, a value of one was received by the voivodship that had the highest indicator among all the voivodships examined. Negative variables, on the other hand, assumed values equal to one for voivodships that were characterized by the lowest indicator of a negative phenomenon. The next step of the study was to calculate the vector of arithmetic means for each of the five microclimates and then to calculate the pseudo-single-feature indicator of investment attractiveness. The results obtained in this way were used in the next stage to calculate the correlation coefficients between the initial indicator of investment attractiveness and the coefficients for each of the microclimates separately. According to the correlation-weight method, the obtained correlation coefficients were used in the next step as weights for the weighted average, which was used to recalculate the average from the previous step with the difference that the arithmetic mean was used for the first iteration and the weighted average for subsequent iterations. These operations are repeated until the correlation coefficients stabilize [17]. For both the 2007 and 2017 studies, II iterations were performed to calculate the weights of individual microclimates. The results obtained after the second iteration (using the weighted average) show the final values of the pseudo-single-feature indicator that determines the attractiveness of individual provinces.

However, before calculating the pseudo-single-feature indicator for each of the voivodships, the variables were selected and divided into microclimates, which present the most important areas taken into account by potential investors when choosing a place for new economic activities. It should be emphasized that over the past two decades, the European textile sector has undergone a profound transformation [18]. The development of regions also of countries that are in the process of accession means seeking innovation not only in areas in which the region has specialized so far, but also in new niches, which implies the development of competitiveness [19]. The analysis used 17 variables, which were grouped into five microclimates. The variables in the study acting as stimulants cause a positive impact on the region's attractiveness for the textile sector development, while destimulating variables have a negative impact. Names of all variables, their affiliation to microclimates, and the nature of their impact on the attractiveness indicator are presented in Table 1.

The next stage of the study was to group the attractiveness of the voivodships studied into six classes. The class intervals were calculated based on the arithmetic mean and the standard deviation of the calculated attractiveness indicators. Average values and standard deviations for both the analyzed years are presented in Table 2.

On the basis of the obtained statistics, six classes of attractiveness were determined. The following are presented in order from Class A, the most attractive for investors, to Class F, which includes the least-attractive cities. These classes are left-bounded closed intervals with lower bounds [16]:

- Class A: arithmetic mean + standard deviation;

- Class B: arithmetic mean + 0.5 x standard deviation;

- Class C: arithmetic mean;

- Class D: arithmetic mean – 0.5 x standard deviation;

- Class F: arithmetic mean – standard deviation;

- Class G: 0.

3. Results and discussion

The study of the climate prevailing in Polish voivodships for the development of the textile sector in 2007 and 2017 shows the directions of changes that have taken place in the past decade. The table below contains indicators of voivodship attractiveness for the development of the textile sector and their affiliation to the designated class of attractiveness (Table 3).

The analysis of the attractiveness of Polish voivodships in terms of creating a favorable climate for the development of the textile sector in 2007 and 2017 shows that the best places for operating in the textile sector are the following: Masovia (Class A in both 2007 and 2017); Silesia (Class A in both 2007 and 2017), and Lesser Poland (Class A in 2017).

Table 1. Microclimates and variables used to build a pseudo-single-feature indicator

Microclimate	Variable	Stimulant (S)/ Destimulant (D)
Technical infrastructure	The length of the active sewerage network per square kilometer	S
	Municipal and poviat roads with a hard surface per 100 km^2	S
	The usable area (in square kilometers) of nonresidential buildings per square kilometer	S
Condition and protection of the environment	Expenditure on environmental protection from the central, provincial, poviat, and commune budgets (in PLN)	S
	Expenditures on fixed assets for environmental protection per capita	S
	Fees and receipts for the environmental protection and water management fund	S
Financial conditions	Internal expenditures in the enterprise sector for R&D activities by origin of resources (all sources)	S
	Expenditure on innovative activity – loans	S
	Expenditure on innovative activity – budget funds	S
	Sold value of industry per enterprise from the textile sector	S
	Costs related to employment in the industrial processing section	D
Demographic conditions	Population density per square kilometer	S
	Registered unemployment rate	D
	Population of nonworking age per 100 people of working age	D
Region's wealth	Average gross salary	S
	Total budget revenues per capita	S
	Budgetary income from corporate income tax per capita	S

Source: Authors' own compilation.

Table 2. Selected descriptive statistics for investment attractiveness indicators

Statistics	Year of the study	
	2007	**2017**
Arithmetic average	0.278542	0.323466
Standard deviation	0.122575	0.093066

Source: Authors' own compilation.

These regions have well-developed technical infrastructure, an extensive market, low level of registered unemployment rates, and relatively high average gross wages and salaries. The textile industry is often located in industrial districts of big cities because it is very labor intensive and its operation is profitable only on a large scale of production.

Statistical data indicate that the textile industry in Poland is experiencing a clear crisis. Due to the decline in exports and competition due to cheap goods from imports (mainly from East Asia), many thriving factories had to be closed. This resulted in high unemployment, especially in the Łódź region. Therefore, the regions in which the textile sector has the least

development opportunities are the following: Lublin (Class F in 2007 and Class E in 2017), Warmia-Masuria (Class F in 2007 and Class E in 2017), Świętokrzyskie (Class E in 2007 and Class F in 2017), and Łódź (Class D in 2007 and Class F in 2017). While the presence of voivodships of Eastern Poland at the top of this ranking is not a surprise, the place of Łódź may arouse controversy – because the Łódź Province was the historical center of the textile industry. For a more detailed analysis, one should look at the values of arithmetic averages of individual microclimates (Table 4).

Variables describing microclimates are characterized by a large territorial diversity. In 2007, the highest variability was recorded for the data describing the region's wealth ($V = 101\%$). The data for the "Condition and protection of the environment" microclimate had the smallest variability ($V = 19\%$). Based on the calculated pseudo-single-feature indicator, it should be noted that the group of the most attractive regions for the textile sector includes Masovia and Silesia. The averages that characterize individual microclimates for these regions indicate that the factors that influence the development of the textile sector most strongly are as follows: financial conditions, demographic conditions, and the region's wealth. For each of

Table 3. The values of the pseudo-single-feature indicator, including the voivodship's affiliation to a class for the years 2007 and 2017

Voivodship	Pseudo-single-feature indicator for 2007	Pseudo-single-feature indicator for 2017	Class in 2007	Class in 2017
Lower Silesia	0.3655676	0.3538162	B	C
Kuyavia-Pomerania	0.2074988	0.275225	E	E
Lublin	0.1567921	0.2524828	F	E
Lubusz	0.2206896	0.329434	D	C
Łódź	0.2389898	0.2244229	D	F
Lesser Poland	0.3120684	0.4389835	C	A
Masovia	0.6421819	0.5664637	A	A
Opole	0.2886147	0.2842356	C	D
Subcarpathia	0.2148431	0.3335612	D	C
Podlaskie	0.2112409	0.3027981	D	D
Pomerania	0.3166335	0.3590965	C	C
Silesia	0.4483118	0.4168519	A	A
Świętokrzyskie	0.167854	0.2015948	E	F
Warmia-Masuria	0.1448821	0.2378865	F	E
Greater Poland	0.3099222	0.3439792	C	C
West Pomeranian	0.2105857	0.2546282	E	E

Source: Authors' own study based on Statistics Poland data.

these microclimates, these regions were above average. At the other end of the ranking are Lublin and Warmia-Masuria. These regions are far different in terms of the region's wealth (average: 0.23; Lublin: 0.04; Warmia-Masuria: 0.09). It is worth noting that the regions of Eastern Poland reached values above average in the "Condition and protection of the environment" microclimate (0.69 and 0.67, respectively, with an average of 0.63). However, significant underdevelopment in terms of expenditures on technical and social infrastructure caused that the textile sector, requiring considerable expenditures, without significant tradition and history in the regions of Eastern Poland, experienced significant developmental difficulties in 2007. On the other hand, the Łódź Voivodship, famous for its textile tradition, in 2007, did not have a significant place in the ranking. The region recorded weak values of the indicator describing "Technical infrastructure" (average: 0.23; Łódź: 0.04) and "Region's wealth" (average: 0.23; Łódź: 0.15).

In 2017, the volatility of values for particular microclimates decreased (for the "Region's wealth" variable, V = 87%); however, there are still significant disparities between the regions. In the year concerned, Lesser Poland joined the group of the most attractive regions creating the optimal climate for the development of the textile sector. The study showed that within 10 years, favorable changes took place in the region in terms of financial conditions, which, as can be seen, constitute an important variable determining the development of the textile sector. An unfavorable drop from Class D to Class F was recorded by the Łódź Province. The crisis in the region and, thus, the lack of an appropriate climate for the development of

the textile sector consists still in the lack of adequate technical infrastructure, as well as the probable outflow of young, talented, and creative residents.

4. Conclusions

Attracting investors and creating optimal conditions for the development of individual branches of the economy are very important elements of local government policy making, because they cause the flow of capital, which allows dynamic economic development of the region. The analysis in this study was aimed at determining the attractiveness level of individual Polish regions for the development of the textile sector in relation to five microclimates, which somehow define the most important determinants of the development of this sector of the economy.

The textile industry deals in the production of products, such as cloths and clothing from woven fabrics, personal underwear and bed linen, kitchen linens, clothing and leather goods, woven fabrics, carpets, rugs, tulles, lace, furs, footwear, and so on, based on natural raw materials. The textile industry is one of the most labor-intensive sectors of the economy and, at the same time, the least effective. In many regions of Poland, it represented a significant share in the economy, but its significance has significantly decreased in the past two decades. Based on the theoretical basis and data from the Local Data Bank of Statistics Poland, an indicator of attractiveness of regions was established in terms of conditions

Table 4. Arithmetic mean of variables in the microclimate in 2007 and 2017

Voivodship	Technical infrastructure	Condition and protection of the environment	Financial conditions	Demographic conditions	Region's wealth
2007					
Lower Silesia	0.204	0.834	0.260	0.646	0.392
Kuyavia-Pomerania	0.170	0.701	0.274	0.372	0.149
Lublin	0.196	0.693	0.402	0.203	0.039
Lubusz	0.234	0.492	0.131	0.474	0.134
Łódź	0.043	0.716	0.429	0.450	0.151
Lesser Poland	0.238	0.619	0.322	0.544	0.229
Masovia	0.111	0.521	0.636	0.507	1.000
Opole	0.498	0.319	0.061	0.541	0.145
Subcarpathia	0.498	0.655	0.341	0.249	0.036
Podlaskie	0.556	0.696	0.173	0.262	0.097
Pomerania	0.033	0.568	0.277	0.511	0.392
Silesia	0.193	0.561	0.346	0.920	0.329
Świętokrzyskie	0.349	0.766	0.265	0.222	0.071
Warmia-Masuria	0.175	0.674	0.265	0.222	0.085
Greater Poland	0.122	0.635	0.303	0.621	0.244
West Pomerania	0.055	0.649	0.224	0.415	0.209
2017					
Lower Silesia	0.298	0.763	0.202	0.498	0.441
Kuyavia-Pomerania	0.450	0.587	0.295	0.334	0.180
Lublin	0.450	0.406	0.322	0.289	0.105
Lubusz	0.556	0.594	0.325	0.449	0.171
Łódź	0.215	0.749	0.291	0.291	0.226
Lesser Poland	0.227	0.573	0.672	0.636	0.287
Masovia	0.029	0.632	0.571	0.363	1.000
Opole	0.431	0.685	0.232	0.566	0.105
Subcarpathia	0.587	0.421	0.402	0.461	0.082
Podlaskie	0.609	0.588	0.226	0.414	0.158
Pomerania	0.122	0.494	0.364	0.452	0.436
Silesia	0.227	0.634	0.413	0.744	0.321
Świętokrzyskie	0.542	0.788	0.193	0.308	0.048
Warmia-Masuria	0.466	0.689	0.302	0.319	0.095
Greater Poland	0.223	0.581	0.328	0.565	0.299
West Pomerania	0.190	0.367	0.255	0.349	0.240

Source: Authors' own calculations based on Statistics Poland data.

for the textile sector development for the years 2007 and 2017 in order to answer the question regarding which areas of the microclimate prevailing in individual Polish voivodships should be strengthened so that the textile sector could develop.

Based on the conducted study, it has been proven that the most attractive regions for the development of the textile sector (over the analyzed years) are Masovia, Silesia, and Lesser Poland (Class A). It can, therefore, be concluded that the development of the textile sector mainly depends on the policy pursued by local governments. Geographical conditions do not ensure that the region will be attractive only due to its good location. This hypothesis has been confirmed by the results obtained for the regions of Eastern Poland, which being far less subsidized, generate unfavorable conditions for the development of the textile sector (classes E and F). However, the opportunities for the development of this sector in Eastern Poland are significant and largely unused. The development potential of the textile sector in the Eastern Poland macroregion is demonstrated

by the location's attractiveness, efficient border crossings, specialist education (numerous vocational secondary schools that are dedicated to clothing technology), development of human capital (cheap labor force), and cooperation within Euroregions.

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