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Changeability of social-economic factors in the development of population transformations of Silesian towns

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CHANGEABILITY OF SOCIAL-ECONOMIC FACTORS IN THE DEVELOPMENT OF POPULATION TRANSFORMATIONS OF SILESIAN TOWNS

ABSTRACT. The paper concerns the assemblage of towns of historical Silesia studied in three patters: 1) as a set of 183 urban centres, 2) in regional system (Lower Silesia, Opole Silesia, Upper Silesia), 3) in size-class pattern (large towns: >100 thousand inhabitants, medium: 20-100 thousand, small: <20 thousand). An attempt was made to identify correlations between the population number and features, which significantly influence population changes. These factors include the assemblages of demographic, infrastructural, economic and financial features. The analysis was performed for four time cross-sections, which represent various political, economic and social situation of Poland (years: 1977, 1985, 1994, 2001). The employed method of step regression made it possible to identify three clear trends of correlations between population and the selected social-economic factors:
— in the scale of the whole territory of Silesia these correlations are rather small, but increasing in time (both before and after political transformation);
— in regional pattern, there is a clear increase of correlations from the west to the east;
— in the pattern of size-classes of towns – the strongest correlations occur in large towns, weaker in medium towns and the weakest in small towns.
KEY WORDS: Silesia, population transformations, step regression, factors of social-economic transformations.

Urban settlement system of the historical area of Silesia shows the occurrence of several types of settlement system, which developed within the attachment to different countries and within administration borders of different provinces. They include Upper Silesian conurbation, agglomeration system of Opole

Silesia and Lower Silesian agglomeration. The latter shows the supremacy of Wrocław and weaker developed middle hierarchical level of towns. These three settlement systems differ from each other in terms of the size structure of towns and also trends of their demographic development (Runge A., 2004a).

The investigations concern the assemblage of towns of Silesia understood as a historical-geographical region (Drobek, 1999), which are analysed in the pattern of individual dimension groups of towns (large, medium, small) on the background of regional system (Lower Silesia, Opole Silesia, Upper Silesia).

The aim of these investigations is the identification of correlations between the population number of the towns studied and the assemblage of social-economic features on the background of regional differentiation and their changeability in time. These studies represent continuation and, at the same time, verification of problems of regional differentiation of factors influencing population transformations of towns (Runge A., 2004b).

The analysis included the assemblage of 12 social-economic features assuming that in the studied period of 1977-2001 they influenced the most the size of urban population (Domański, 1995). The features concerned the assemblages of demographic, infrastructural, financial and economic features. Some difficulties in obtaining a complete range of comparative data caused than in 1977 the investigations included 10 features (without the employment in trade per 1,000 inhabitants and the percentage of the employed per total employment), and in 1994 the investigations did not consider population per 1 shop. In order to solve the problem of the work, the method of step regression analysis was applied (Draper, Smith, 1973). The degree of the adjustment of the significant features in the model of step regression was determined using a corrected coefficient of determination R^2. The applied corrected coefficient of determination was taken after Ratajczak (2002, p.81-82), who demonstrates that having large number of independent variables the use of the corrected coefficient decreases a hazard of choosing false models.

The first stage of investigations included the identification of these social-economic variables, which in individual time intervals, appeared to be the most intensively correlated with the size of population of the historical area of Silesia. Tab. 1 shows these variables, which were selected with the use of the method of step regression. Using the coefficient of corrected determination, a degree of adjustment of the step regression model to input data was demonstrated. As far as the type and order of the identified significant features in the model in the period of central planned economy were in fact constant, in new social-economic reality they considerably changed. Instead of the so far leading role of trade, the services connected with health protection predominated (1994). This resulted from rapid privatisation of trade and also from the shifting of the considerable part of trade activity to informal sector (street trade, market trade) in the first years of transformation period. On this background, a feature from the health protection assem-

blage gained larger importance as this type of activity underwent privatisation in much smaller range. The symptom of developing qualitative changes was the origin of a financial feature in 2001. In the period of the already established structural changes of political-economic transformation, the increase of the number of significant changes in the regression model occurred. The changes in a hierarchy of the significant features in the model of step regression should be explained as a derivative of political-economic transformations from the turn of the 1980s and 1990s. In the conditions of centrally planned economy norms used in spatial management (local and regional) caused the necessity of the adjustment of number and structure of trade-service establishments to the size of population. These norms were not always fulfilled but in the field of basic services for population they were the closest to the declared requirements. Other problem was the relation between the degree of saturation of service establishments and a real fulfilment of the inhabitant needs (these standards were very low as compared to European standards). New social-economic reality of the 1990s caused that norms were left behind what influenced a development of demand-supply mechanisms in local and regional development. Therefore, among the variables which were the most correlated with population size occur since then both these, which were the remainders of "norm period" and those which are typical for transformation period (e.g. financial features).

Table 1. Social-economic features significantly correlated with changes of population in Silesian towns in the period 1977-2001 (total)

YEARS	SOCIAL-ECONOMIC FEATURES SIGNIFICANT IN THE STEP REGRESSION MODEL	R^2
1977	Population per 1 shop Doctors per 10 thousand population Natural increase per 1,000 population	28.87
1985	Population per 1 shop Doctors per 10 thousand population Natural increase per 1,000 population Incomes of counties budgets per 1 inhabitant Employed in trade per 1,000 population	36.09
1994	Doctors per 10 thousand population Employed in trade per 1,000 population Percentage of employed in industry in a total employment Expenses of counties budgets per 1 inhabitant Employed in trade per 1,000 population	15.46
2001	Expenses of counties budgets per 1 inhabitant Doctors per 10 thousand population Population per 1 shop Employed in trade per 1,000 population Population per 1 room in dwelling resources Coefficient of migration efficiency Dwellings completed per 1,000 population Natural increase per 1,000 population	31.11

Source: the Author's elaboration

A statistical adjustment of features in the regression model is not too high, but a trend of the increase of this adjustment is visible. This trend occurred first in the period 1977-1985 and then in the period 1994-2001. Weak adjustment of the model suggests large regional differentiation of factors influencing population transformations. Thus, significant features correlative with the population size within individual settlement systems were analysed, which gave regional differences.

In the second stage of investigations the answer to the question was investigated whether there are differences between historical-geographical parts of Silesia (Lowe Silesia, Opole Silesia, Upper Silesia) in the identification of these variables, which correlate the most with the population size (Tab. 2).

Among the three areas studied, Lower Silesia shows the weakest adjustment of step regression models to the observed data, whereas Upper Silesia – the strongest. Generally the intensity of this adjustment grows from the west to the east. Moreover, in the period 1977-1985 a clear step-like trends of changes of this adjustment is observed (except Opole Silesia), which was caused by strong social-economic perturbations connected with the political turn of 1989. Therefore the trends of the increase of the adjustment of significant features in the regression model is visible in the periods of relative political-economic stabilisation – in the years 1977-1985 and 1994-2001.

In Lower Silesia, among features significantly correlated with population size infrastructural features, mainly trade and health protection, predominated. Dwelling appeared in 1994. The economic feature occurred in 1977. Among demographic features the influence of natural increase is observed in the 1970s and 1980s, and migration in 2001. A significant change in 2001 consisted in predomination of a financial feature over infrastructural features.

The hierarchy of the identified variables for Lower Silesia appeared to be similar to the whole of towns of the historical area of Silesia. The weak adjustment of regression models may be explained in two ways. Firstly, it results mainly from considerable differentiation of the assemblage of towns studied, both in dimensional and functional terms, and secondly, from their administrational attachment to different provinces (at present to 2 but in previous administration division to as many as 7 provinces). Settlement system of Lower Silesia shows strong position of Wrocław in relation to other middle and small towns of this area, which creates certain consequences in form of "washing out" of development factors – the effect of the so called metropolis shadow. In the shadow of Wrocław metropolis only small towns occur. The zone of medium and large towns occur in large distance of Wrocław. These towns are not considerably influenced by Wrocław because they have their own, strong town-creating functions (many of them used to have administration functions on province level). This is reflected in conditions and differential of demographic and economic changes of the investigated assemblage of towns (Wrocław – demographic transformation).

Table 2. Social-economic features significantly correlated with the changes of population in Silesian towns in the period 1977-2001 (in regional systems)

YEARS	LOWER SILESIA	R^2	OPOLE SILESIA	R^2	UPPER SILESIA	R^2
	SOCIAL-ECONOMIC FEATURES SIGNIFICANT IN THE MODEL OF STEP REGRESSION					
1977	Population per 1 shop Doctors per10 thousand population Incomes of counties budgets per 1 inhabitant Natural increase per 1,000 population Employment in industry per 1,000 population	16.99	Population per 1 shop Doctors per 10 thousand population Dwellings completed per 1,000 population Employed in industry per 1,000 population Expenses of counties budgets per 1 inhabitant Incomes of counties budgets per 1 inhabitant	57.41	Doctors per 10 thousand population Population per 1 shop Expenses of counties budgets per 1 inhabitant Dwellings completed per 1,000 population Migration balance per 1,000 population Population per 1 room in dwelling resources	44.86
1985	Population per 1 shop Doctors per10 thousand population Natural increase per 1000 population Incomes of counties budgets per 1 inhabitant	22.50	Population per 1 shop Employed in trade per 1,000 population Coefficient of migration efficiency Incomes of counties budgets per 1 inhabitant Expenses of counties budgets per 1 inhabitant	54.09	Migration balance per 1,000 population Population per 1 shop Population per 1 room in dwelling resources Employed in trade per 1,000 population Natural increase per 1,000 population Percentage of employed in industry in totalemployment Expanses of counties budgets per 1 inhabitant Incomes of counties budgets per 1 inhabitant	61.45
1994	Doctors per 10 thousand population Dwellings completed per 1,000 population	5.99	Dwellings completed per 1,000 population Employed in trade per 1,000 population Expenses of counties budgets per 1 inhabitant Percentage of employed in industry in total employment Population per 1 room in dwelling resources	38.74	Expenses of counties budgets per 1 inhabitant Doctors per 10 thousand population Employed in trade per 1,000 population Dwellings completed per 1,000 population	58.93
2001	Expenses of counties budgets per 1 inhabitant Dwellings completed per 1,000 population Population per 1 shop Employed in trade per 1,000 population Population per 1 room in dwelling resources Incomes of counties budgets per 1 inhabitant Coefficient of migration efficiency	22.57	Expenses of counties budgets per 1 inhabitant Employed in industry per 1,000 inhabitants Dwellings completed per 1,000 population Employed in trade per 1,000 population Coefficient of migration efficiency	68.16	Expenses of counties budgets per 1 inhabitant Coefficient of migration efficiency Natural increase per 1,000 population Doctors per 10 thousand population Expenses of counties budgets per 1 inhabitant Percentage of employed in industry in total employment Dwellings completed per 1,000 population Employed in trade per 1,000 population	76.05

Source: The Author's elaboration

Moreover, it should be remembered that Lower Silesia in the post-war period showed relatively small investment expenditure as compared to other areas of Poland (Ciok, 1993). Underdevelopment of social infrastructure, especially in the southern part of Lower Silesia (former Jelenia Góra Voivodeship and Wałbrzych Voivodeship), development of Legnica-Głogów Copper Area in the northern part, or supremacy of Wrocław represent factors which influenced the most regional and local differentiation of features significantly correlative with population size. These factors spatially modify the correlations between the population size and the included social-economic variables.

In the towns of Opole Silesia in the period of central management of economy (1977, 1985) the position of the significant features was similar to the whole towns of historical Silesia. Until the mid 1990s, infrastructural features of trade, health protection and dwelling predominated, however, still in the period of centrally planned economy the spectrum of these features included also an economic feature (the employment in industry per 1,000 inhabitants) and financial features (incomes and expenses of counties budgets per 1,000 inhabitants). There was the lack of the influences of demographic features. In 1985, the coefficient of migration efficiency became more important. Later, the variable connected with dwelling situation and trade predominated (1994) followed by variable connected with financial and economic sphere (2001). Despite generally difficult situation of housing industry in the 1990s, the individual achievements in that sphere in Opole Silesia place this region in better position than other parts of Silesia. In 2001, similarly to other regional systems, the financial feature predominates with large contribution of infrastructural features (trade, dwelling), but unlikely to Upper or Lower Silesia, the role of economic features considerably increases. Large position of the employed in industry suggests that the role of traditional economic activity in Opole Silesia is significant, which is especially connected with its eastern part adjacent to Upper Silesia. The influence of demographic features was the weakest (migrations). The outlined trends differ from a general trend visible in the scale of the whole towns of Silesia.

The settlement system of Opole Silesia is strongly integrated by the influence of Opole, what creates considerable homogeneity of features influencing demographic changes. Therefore this area shows strong adjustment of the significant features in the regression model.

At first, in the towns of Upper Silesia, similarly to other parts of Silesia, infrastructural features correlated the strongest with the population size. Also financial features were of significant importance (like in Opole Silesia). Differently to other regional systems studied, demographic features, especially migrations, played a significant role influencing population changes. A feature reflecting the importance of industrialisation processes occurred only twice (1985, 2001) in the period connected with the drop of the number of the em-

ployed in industry. The state of saturation of the job market with workforce (restraint of the demand for workforce) in the mid 1980s was connected with the termination of large industrial enterprises in the region (Runge, Kłosowski, 2000; Runge *et al.*, 2003). The restrained reduction of the employment in industry intensified at the end of the 1990s. Wide spectrum of the significant features and also very high level of the adjustment of the models of step regression to output data suggest that the areas of domination of large or medium towns (or smooth settlement structure) show better adjustment in this range than strongly diversified areas (with domination of one centre) or with large percentage of small towns.

This conclusion requires however a thorough verification. Therefore the *third stage of statistical investigations* was carried out. The whole assemblage of Silesian towns was divided into three classes according to their sizes: small towns (up to 20 thousand inhabitants), medium towns (20-100 thousand) and large towns (over 100 thousand). Next, for the assemblage of each size-class, the models of step regression were constructed, which made it possible to identify the features that correlate the strongest with population size (Tab. 3).

The results of this investigation confirm the thesis that the most significant correlative features concern most of all large towns, then medium towns, whereas small towns show weak correlations. As far as in the period of centrally governed economy, in large towns, the intensity of the model adjustment was increasing almost reaching 100%, in medium towns it rapidly decreased in the end of the period of planned economy, which suggests that towns of this size were sensitive to the growing symptoms of economic crisis. In small towns the level of the features adjustment was constantly low.

In the new political conditions, large towns, after initial rapid correlation weakening, showed its significant increase. Similar trends were observed in medium towns, however in this case the weakening of correlation in regression model was very strong, which was conditioned by perturbations connected with the establishment of new political-economic system. After the period of spontaneous social-economic transformations, a gradual restoration of the correlations studied occurred, which was accompanied by considerable enlargement of the spectrum of significant features in the model. The strongest adjustment of features occurred in 1977, and then it gradually decreased – first as a result of growing economic crisis in the beginning of the 1980s, and next because of a very difficult beginning of political-economic transformation (1994). A stabilisation of political-economic transformations occurred in the increase of the adjustment of the features studied n 2001. Medium towns appeared to be therefore the most sensitive to political-economic transformations of the turn of the 1980s and 1990s.

In small towns further mitigation of already weak correlations in the regression model occurred.

Table 3. Social-economic changes of significantly correlated with the population changes in Silesian towns in the period 1977-2001 according to the size classes of towns

YEARS	SOCIAL-ECONOMIC FEATURES SIGNIFICANT IN THE MODEL OF STEP REGRESSION					
	LARGE TOWNS	R^2	MEDIUM TOWNS	R^2	SMALL TOWNS	R^2
1	2	3	4	5	6	7
1977	Doctors per 10 thousand population Dwellings completed per 1,000 population Population per 1 shop Population per 1 room in dwelling resources Employed in industry per 1,000 population Coefficient of migration efficiency	78.96	Population per 1 shop Natural increase per 1,000 population Incomes of counties budgets per 1 inhabitant Coefficient of migration efficiency Migration balance per 1,000 population	48.89	Coefficient of migration efficiency Population per 1 shop Doctors per 10 thousand population Dwellings completed per 1,000 population Employed in industry per 1,000 population	29.05
1985	Expenses of counties budgets per 1 inhabitant Population per 1 room in dwelling resources Incomes of counties budgets per 1 inhabitant Doctors per 10 thousand population Employed in trade per1,000 population Percentage of employed in industry in total employment Coefficient of migration efficiency Migration balance per 1,000 population Natural increase per 1,000 population Employment in industry per 1,000 population	94.22	Population per 1 shop Population per 1 room in dwelling resources Employed in industry per 1,000 population Natural increase per 1,000 population	29.21	Doctors per 10 thousand population Population per 1 shop Percentage of employed in industry in total employment Natural increase per 1,000 population Coefficient of migration efficiency Dwellings completed per 1,000 population Incomes of counties budgets per 1 inhabitant Expenses of counties budgets per 1 inhabitant	27.09
1994	Doctors per 10 thousand population Dwellings completed per 1,000 population Employed in trade per 1,000 population Natural increase per 1,000 population	44.53	Population per 1 room in dwelling resources Employed in trade per 1,000 population Doctors per 10 thousand population Employed in industry per 1,000 population Migration balance per 1,000 population	14.64	Employed in industry per 1,000 population Dwellings completed per 1,000 population Doctors per 10 thousand population Employed in trade per 1,000 population Percentage of employed in industry in total employment Population per 1 room in dwellings resources Coefficient of migration efficiency Expenses of counties budgets per 1 inhabitant Incomes of counties budgets per 1 inhabitant	15.92

1	2	3	4	5	6	7
2001	Expenses of counties budgets per 1 inhabitant Incomes of counties budgets per 1 inhabitant Population per 1 shop Doctors per 10 thousand population Dwellings completed per 1,000 population	66.38	Population per 1 room in dwelling resources Employed in trade per 1,000 population Population per 1 room in dwelling resources Coefficient of migration efficiency Percentage of employed in industry in total employment Incomes of counties budgets per 1 inhabitant Migration balance per 1,000 population Expenses of counties budgets per 1 inhabitant Employed in industry per 1,000 population	30.48	Employed in industry per 1,000 population Employed in trade per 1,000 population Incomes of counties budgets per 1 inhabitant Natural increase per 1,000 population	13.03

Source: The Author's elaboration

It should be concluded therefore that the selected for the investigation social-economic factors correlated in the first case with population changes in large towns, showing slight mitigation of this relation in the beginning of the 1990s. In case of medium towns, first the decrease of their importance was observed, and then in new political-economic reality – the increase of their position. In small towns – independently to the period of investigations – the discussed social-economic factors correlated less and less with population changes.

Simultaneously in the area of historical Silesia, three trends of correlations between population and the selected social-economic factors occur. They are as follow:

— in the scale of the whole territory these correlations are rather insignificant but growing – first until the mid 1980s and then after a break in 1994 still growing;

— in the regional pattern there is an increase of correlations from the west to east;

— in the pattern of size classes of towns these interdependencies correlates to individual size groups of towns – the strongest occur in large towns, weaker in medium towns, and the weakest occur in small towns (they get smaller together with the decrease of population number).

Another problem is a hierarchy of features in the regression model in individual size groups of towns. In large towns a large spectrum of features occurs which are significantly correlated with population size in all investigated time cross-sections (Tab. 3). In 1977, this concerned 6 features mainly infrastructural (health protection, dwelling, trade) – therefore, similarly to regional patterns, but also economic and demographic features occured. In 1985 the number of features increased to 10 and the appearing financial features, accompanied by infrastructural features showed the predominating influence on population transformations. Also economic features occurred as well as the whole spectrum of demographic features. In new political-economic conditions, the adjustment of features significantly correlated to population changes slightly decreased but it was still strong. However, the structure of features significantly influencing population changes "retarded" – and was similar to that from the 1970s (domination of infrastructural features over demographic feature). After overcoming perturbations connected with political-economic transformation, a subsequent strong increase of significance level of the features studied occurred and some changes in their hierarchy took place. Financial features on the first place followed by infrastructural features were the strongest correlated with population size.

In the beginning (1977) in medium towns, trade was the strongest correlated with size population, but in fact, population transformations which occurred here were influenced by demographic features. A financial feature also occurred. In next time cross-sections, the influence of demographic and financial features decreased. Until 1994, on the background of permanent decrease of the

correlation of the investigated features in the regression model, there was a domination of infrastructural features supported by economic feature and demographic feature. The tightening of correlations between population changes and the assemblage of the investigated features occurred in the last time cross-section, after the establishment of political-economic transformations. The increase of the significance level was accompanied by strong widening of a spectrum of significant features in the regression model. However still, infrastructural features supported by other groups of features predominate.

In the 1970s, population changes of small towns were mainly influenced by demographic feature (coefficient of migration efficiency) as well as the assemblage of infrastructural features which were supported by the impact of industrialisation. In the 1980s, spectrum of significant features enlarged and became differentiated. Infrastructural features predominated – similarly to most of the systems studied, supported by economic and demographic features. In the conditions of transformation, economic features strongly supported by infrastructural and financial features (1994) appeared to be basic features influencing population changes. In the last time cross-section, only 4 significant features influenced population transformations in small towns, but their adjustment in the regression model is rather weak. Still economic feature predominated.

It may be stated therefore that large towns due to their spatial-functional and social-economic complexity show a complex pattern of correlations between population size and social-economic conditions. This results in a wide spectrum of factors showing the correlation with population size and influencing the direction and dynamics of population changes.

Middle towns in many cases represent centres which underwent considerable urbanisation after 1945, connected with location in these towns certain types of economic activity. This was accompanied by the development of house building (together with social infrastructure). The relation of these three constituents was especially visible in the 1970s, so it should be assumed that large value of R^2 for medium towns in 1977 results from this fact. Because many medium towns represent centres of monofunctional character, therefore such factors as difficulties on job market or decline of house building contributed to considerable decrease of the role of the investigated factors in this group of towns. In the beginning of the 21st century, an increase of the adjustment between the variables studied is visible, which should be explained by larger determination of local authorities in searching for new development factors (Parysek, 1995).

In the period of centrally planned economy, population processes occurring in the studied settlement systems in general were stimulated by similar growth factors (Runge, 2004b). Development of territorial governments and political-economic changes of the transformation period revealed regional differentiation of factors influencing social-economic development of these systems and gave

them chance for individual development according to their regional conditions and settlement patterns.

CONCLUSIONS

In the period 1977-2001, the assemblage of features significantly correlated with population size of Silesian towns underwent considerable changes. In the scope of regional differences, the most important include:
— similarities of features significantly correlated with population size of towns in all the investigated regional systems in centrally managed economy, and then differentiation of this spectrum of features in new political-economic conditions;
— transition from the domination of infrastructural features in the regression model to financial features supported by various groups of features in individual regional systems;
— clear differences in the adjustment intensity of the significant features in the regression model and in the trend of its transformations – the weakest adjustment with a trend of further mitigation of these correlations in Lower Silesia, with strong and constantly increasing adjustment of these correlations in Upper Silesia and Opole Silesia. Simultaneously, in all the regional systems an extremely significant decrease of these correlations occurred in the period of transformation conversion (1994), followed by a renewed increase of these correlation in Upper Silesia and Opole Silesia, whereas in Lower Silesia considerable differentiation occurred resulting in mitigation of the analysed relations (lack of statistical significance).

In the scope of differences between the size groups of the towns studied, the most important include:
— the occurrence of strong correlations between the assemblage of the investigated social-economic changes and population size in the group of large towns, weaker correlations in the group of medium towns and very weak correlations in the group of small towns;
— the occurrence of similar trends of changes in the adjustment of the significant features in the regression model like in regional systems – i.e. these size categories of towns which in the time of centrally governed economy already showed large significance of features in the regression model (large and medium towns), after the period of perturbations connected with transformational conversion, renewed these correlations, whereas in small towns these process became mitigated and these correlations became statistically insignificant;
— structural changes of the significant features in the model consisted in the domination of infrastructural features by financial features in large towns, and domination of demographic features by infrastructural features in me-

dium towns. The appearing in new political-economic conditions domination of financial features clearly observed in all the regional systems is not therefore so clear in individual size groups of towns.

The differentiation of the adjustment intensity of these features between the individual size groups results from larger vulnerability of small towns to extremely differentiated local and regional conditions, whereas medium towns in their development are more intensively influenced by regional differentiations than local differentiations, and large towns side by side with regional conditions are influenced by factors of national level. The vulnerability to the analysed spectrum of factors depends also on the functional structure of towns – large towns of differentiated functional structure react on the influencing factors in more flexible way, whereas, taking into account large functional specialisation of small towns it is difficult to determine the assemblage of growth factors which would be identical for so differentiated set of towns. The differentiation of factors and lack of their adjustment in the regression model probably suggests the increase of local conditions over external influences in social-economic transformations of these towns.

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