

# LATVIAN MUNICIPAL BUDGET EXPENDITURES ON TRANSPORT INFRASTRUCTURE AND PRODUCTION IN THE CONTEXT OF IMPROVING THE LOCAL ECONOMY

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## ABSTRACT

This article aims to study Latvian municipal budget expenditures on transport infrastructure and production in the context of improving the local economy. The authors hypothesize that the state of the local economy determines the comparative priority of municipal budget expenditures on two items. In municipalities with a more developed economy, it is 'transport' rather than 'production' budget expenses that are more likely to improve the local economy, and in municipalities with a less developed economy – vice versa. The authors tested the hypothesis based on data for 2021 and 2022 (the time after the reform of the territorial-administrative structure of Latvia) for 43 Latvian municipalities using various methods of statistical analysis. The results show that the comparative priorities in budget expenditures of Latvian municipalities are determined not by the state of the local economy but rather by the geographical (or geopolitical/geoeconomic) location of the municipality. As a result, Latvian municipalities are grouped into territorial clusters using the agglomeration effect from the concentration of transport infrastructure or production. Over the past year, there has been a tendency towards 'transport-production' economic restructuring of the territory of Latvia, the reasons for which may be the geopolitical situation in Eastern Europe.

**Keywords:** transport infrastructure; production; municipal budgets; local economy; statistical analysis; Latvia

## INTRODUCTION

The American company GovPilot (2023), a leader in providing digital transformation services to US municipalities, reported that the transition from a business culture of traveling to offices every weekday to a culture of 'work from anywhere' creates new economic challenges for municipal authorities. Many Americans are moving from large, expensive cities to smaller cities and suburban areas. This means that local municipalities must prepare for an increase in new business registrations, new zoning, and the need for better digital and physical infrastructure to accommodate a growing population and ensure its economic activity. In Latvia, there is also a tendency of population movement from the capital region and other large cities to suburban municipalities (the so-called 'rural gentrification' – Dwight Hines, 2011). Thus, over the period 2021–2022, the population of Riga (the Latvian capital city) decreased by 2.5 thousand people (with a population of 610 thousand people in 2021), while the population of nearby Riga municipalities increased noticeably over the same period. – For example, in the Marupe municipality, with a population of 33.6 thousand people (in 2021), the annual increase was 1.6 thousand people (calculated by the authors based on data from the Central Statistical Bureau of Latvia, 2023). At the same time, for example, in the Kraslava municipality, which is very remote from the capital of Latvia, with a population of 21 thousand people (in 2021), the annual decrease in the number of residents was 570 people (calculated by the authors based on data from the Central Statistical Bureau of Latvia, 2023).

Thus, given the cultural and economic conditions that have changed during the Covid-19 pandemic, an increase in both 'remote' and traditional economic activity in municipal territories can be an important factor for the sustainable development of municipalities and regions as a whole, since it [economic activity] promotes development and attracts investment, creates jobs, improves living conditions and the general well-being of the population of the relevant municipal territories (Capello, 2009). But what helps to increase economic activity itself in municipal territories or, more generally, to improve the economy of these territories?

In the framework of this study, the authors will limit themselves to studying only two factors –

transport infrastructure and production in the territory – which potentially influence the economy of Latvian municipalities and compete with each other for financial resources from municipal budgets. For example, the government of the Latvian capital city continues to significantly increase budgetary investments in urban transport infrastructure, which in 2023 will reach a historically high volume of 41 million euros (Department of External Communication of Riga City Council, 2023). Vice versa, through various activities, the municipality of Ventspils (one of the relatively large cities in Latvia and its growth pole), including financial, administrative, and information support, promotes the creation and attraction of new enterprises in the city, as well as supports and motivates existing enterprises (Daily Business, 2022), i.e., stimulates primarily the development of production rather than transport infrastructure. The main research question for the authors of this article, then, can be formulated as follows: what is the comparative priority of budget financing of Latvian municipalities in the context of improving their economy – transport infrastructure or production – and how is this determined?

The article aims to study Latvian municipal budget expenditures on transport infrastructure and production in the corresponding territory ('transport' and 'production' expenses) in the context of improving the local economy. To achieve this goal, various statistical analysis methods will be used. The empirical basis for this study is the Basic Budget Implementation Reports submitted by Latvian municipalities to the State Treasury in 2021 and 2022 (State Treasury of Latvia, 2023), taking into account the number of inhabitants (Central Statistical Bureau of Latvia, 2023) in the corresponding municipal territories (to calculate per capita indicators). The time from 2021 to 2022 is the time after the reform of the territorial-administrative structure of Latvia in 2020 (Saeima of Latvia, 2020). This is the main limitation of the results of the study, but at the same time, it allows, to a certain extent, to assess the first consequences of this reform for the economic development of the restructured Latvian municipalities.

The following section provides a review and analysis of the literature containing the results of research on the topic of the development of transport infrastructure and production in the

context of improving the local economy. Then, the authors describe the conceptual framework of the study, materials, and methods and then show and discuss the results. Based on the study results, the authors draw certain conclusions and propose practical recommendations for Latvian municipalities, which can also be used in the work of municipalities in other Eastern European countries that are similar to Latvia in terms of socio-economic development.

### LITERATURE REVIEW

Many studies have been carried out in the international scientific space, which has investigated the importance of transport infrastructure for economic growth and development (economic, long-term, etc.) of territories, as well as for improving the economic performance of territories (Aschauer, 1990; Munnell, 1992; Niedole & Averyanov, 2011; Melo et al., 2013; Boruch, 2014; Cigu et al., 2019; Gherghina et al., 2018; Wang et al., 2018; Zhang & Qi, 2021; Prus & Sikora, 2021). At the same time, a sufficient number of studies have been conducted (but it seems that less than on the importance of transport infrastructure) that have investigated the importance of production for economic growth and development of territories, as well as for increasing their economic performance (Garofolo, 1993; Fujita & Thisse, 2002; Yong, 2021).

The results of the first group of studies (on the importance of developed transport infrastructure for the economy of territories) almost unanimously speak in favor of the hypothesis about the priority of developed transport infrastructure for the economic development of a territory in the modern world. For example, the American researcher Aschauer (1990), using data on real growth in per capita income and on the quality and quantity of highways in 48 US states for the period from 1960 to 1985, concluded that the quality and quantity of highways (both urban and rural) has a direct impact on economic growth. He formulated this conclusion in the form of a short thesis: 'good roads are good business' (Aschauer, 1990). He explained the mechanism of this influence as follows: increasing the level and quality of highway capacity expands the range of transport services and thereby increases the marginal product of private capital. In turn, a higher marginal product of capital contributes to

increased investment in physical capital and higher income and output per capita. Thus, municipalities can influence the rate of economic growth within their territory (Aschauer, 1990). Thus, as a result of this study, the following logical chain is derived: developed transport infrastructure to developed business (including production) to developed economy of the territory.

In turn, the American researcher Munnell (1992), based on the results of research by Aschauer and other economists, studied the impact of investments in public infrastructure, including transport infrastructure, on economic growth in the United States (by economic growth, meaning the development of economic activity), and comparing the arguments of supporters and opponents of investments in public infrastructure. As a result, Munnell concluded that in addition to immediate economic effects, investment in public infrastructure has a significant positive impact on economic output and growth. According to Munnell (1992), this area of research could have important implications for economic policy in any country.

The Latvian researchers Niedole and Averyanov (2011), having conducted an empirical study of the accessibility of a territory based on the case of one Latvian municipality, concluded that the use of a territory's resources is a function of the development of transport infrastructure in the territory. Thus, transport infrastructure is considered one of the main elements influencing the decision to locate production enterprises (Aschauer, 1990; Niedole & Averyanov, 2011; Cigu et al., 2019), once again confirming the cause-effect chain derived by Aschauer (1990): developed transport infrastructure to developed production to the developed economy of the territory. In this regard, the main macro-problem of the Latvian transport infrastructure is its integration into the pan-European transport system. For example, until now, and although more than 30 years have passed since the collapse of the USSR and the restoration of Latvian independence, all railway transport in Latvia is operated on Russian standard railways; the total length of such broad-gauge railways is 2270 km, of which 2206.3 km are in operation (Boruch, 2014).

A group of British researchers conducted a meta-analysis of empirical data on the

productivity of transport infrastructure investments and concluded that transport infrastructure investments are widely used by decision-makers to stimulate economic growth, especially during periods of economic downturn (Melo et al., 2013). The researchers noted that since the late 1980s, extensive international research has been conducted on the relationship between transport infrastructure and economic performance, producing a wide variety of data. For example, the results of some global studies have shown that the impact of transport infrastructure on the economic development of a territory is higher in the United States than in European countries, it is higher for highways compared to other types of transport infrastructure, and it is also higher for the primary sectors of manufacturing and construction (Melo et al., 2013).

Thus, the expansion of transport infrastructure around the world and the development of the transport sector, in general, are much more complex in terms of effects and consequences, and many researchers have focused not on economic growth as a result of the development of transport infrastructure, but on the wider dimension of sustainable development (for example, Wang et al., 2018; Prus & Sikora, 2021). In the context of sustainable development as a need of every society, a significant part of the research is focused on analyzing the impact of transport development on the environmental and social components in connection with economic growth. The transport sector accounts for about a quarter of the world's carbon dioxide (CO<sub>2</sub>) emissions (Linton et al., 2015). And although this indicator relates to the transport sector in general, but the development of transport infrastructure, which is the 'carrier of transport' (without transport routes there is no transport), makes a huge, albeit indirect, contribution to environmental pollution via transport vehicles. However, a group of Chinese researchers applied regression models to analyze data from 83 Chinese cities over the period 2000–2012, found that in the long term, investment in urban transport infrastructure can reduce air pollution (Sun et al., 2018). In turn, a group of Romanian scientists in their study regarding the EU-28 countries concluded that in the short term there is a relationship between carbon dioxide emissions from railway transport and economic growth and a unidirectional relationship leading from economic growth to an

increase in CO<sub>2</sub> emissions from road and domestic air services (Gherghina et al., 2018). In turn, a group of Romanian scientists, in their study regarding the EU-28 countries, concluded that in the short term, there is a relationship between carbon dioxide emissions from railway transport and economic growth and a unidirectional relationship leading from economic growth to an increase in CO<sub>2</sub> emissions from road and domestic air services (Gherghina et al., 2018). In the context of this study, the very idea of considering 'transport' effects in connection with the broader concept of sustainable development of the territory (Wang et al., 2018; Prus & Sikora, 2021) or at least in connection with the economic development of the territory (Zhang & Qi, 2021), and not only in connection with its economic growth, is valuable and progressive.

As for the second group of studies, those on the importance of developed production for the economy of territories, according to the Chinese researcher Yong (2021), after a break in its popularity in the 1990s, industrial policy is again attracting attention around the world as a driving force for achieving economic and broader social goals. This is especially true for low-income countries, where industrialization continues to be a critical driver of economic growth (Yong, 2021). In turn, high-income countries are seeing a shift from production landscapes to consumption landscapes that require transport infrastructure and offer a different type and quality of production. For example, the American researcher Dwight Hines (2011) focused on the transition from the previous dominance of the production/consumption of goods/natural resources regime to the growing dominance of the production/consumption of 'experiences'. The growing dominance of the latter is largely a result of the increasing local migration of former urban post-industrial middle classes to the 'amenity-rich' suburbs (Dwight Hines, 2011).

As many development historians and theorists have noted, economic growth tends to be localized (Fujita & Thisse, 2002). Local institutions and collective actors (both private actors, i.e., consortia of enterprises, and government agents) can help 'strengthen the strengths', as well as 'repair the weaknesses' of the local production system through the use of specific tools to support the local economy: for

example, solving problems resulting from market failures. This means not only the introduction of specific forms of local social regulation but also the establishment of informal links between the production system and local society (Garofoli, 1993). To describe these effects, Fujita and Thisse (2002) used Marshall's concept of externalities, which identifies the benefits associated with the formation of an industrial agglomeration and assumes that these benefits arise from (1) the formation of a highly specialized workforce and the development of new ideas based on both the accumulation of human capital and on interpersonal communication; (2) availability of specialized services; and (3) the presence of modern infrastructure (including transport infrastructure).

In general, a wide range of terms are used in economic studies: economic growth of a territory to indicate the scope of application of the desired effect from a developed transport infrastructure or developed production (Aschauer, 1990; Munnell, 1992; Boruch, 2014), including long-term economic growth (Gherghina et al., 2018; Cigu et al., 2019), economic and long-term development of the territory (Garofoli, 1993; Wang et al., 2018; Prus & Sikora, 2021; Zhang & Qi, 2021), socio-economic development of the territory (Voronov, 2023), as well as regional growth (Fujita & Thisse, 2002). This diversity in terminology leads to some confusion, since, for example, economic growth does not always mean economic development (the classic of understanding of this difference, which consists in reducing unemployment and poverty with economic development in addition to the rise of GDP with economic growth, is considered to be the British / New Zealand economist Seers (1969)) and especially the long-term development of the territory. Modern economic studies of "the impact of developed production on..." also use such vague terms as regional growth (Fujita & Thisse, 2002; Capello, 2009) and regional sustainability (Semin, 2021).

Thus, it should be noted that researchers studying the economic effects of a developed transport infrastructure and developed production do not care too much about the accuracy of terminology. They use even such a controversial notion as 'productive economic development' (Popov et al., 2022); the reason for

its inconsistency is the fact that any economic development is productive, if only because it is development, and if it is unproductive, then it is not development at all. Therefore, the authors of this study, following the already proven experience of researchers such as Meyer (2019) and Kastolani et al. (2022), will study the 'impact on the economy' (Meyer, 2019) or 'improving the local economy' (Kastolani et al., 2022) using the indicators available in the territorial statistics of Latvia, measuring the state of the economy of its municipalities.

Based on the literature review, the authors put forward the hypothesis that the comparative priority of municipal budget expenditures between two positions - transport infrastructure or production - is determined by the state of the local economy, i.e., most likely, municipalities with a more developed economy finance transport infrastructure relatively more as a driving force for the development of production in the corresponding territory and further growth of the local economy than production on their territory, and municipalities with a less developed economy more actively finance production in their territory, which, rather than funding of transport infrastructure, improves the state of the local economy.

## CONCEPTUAL FRAMEWORK

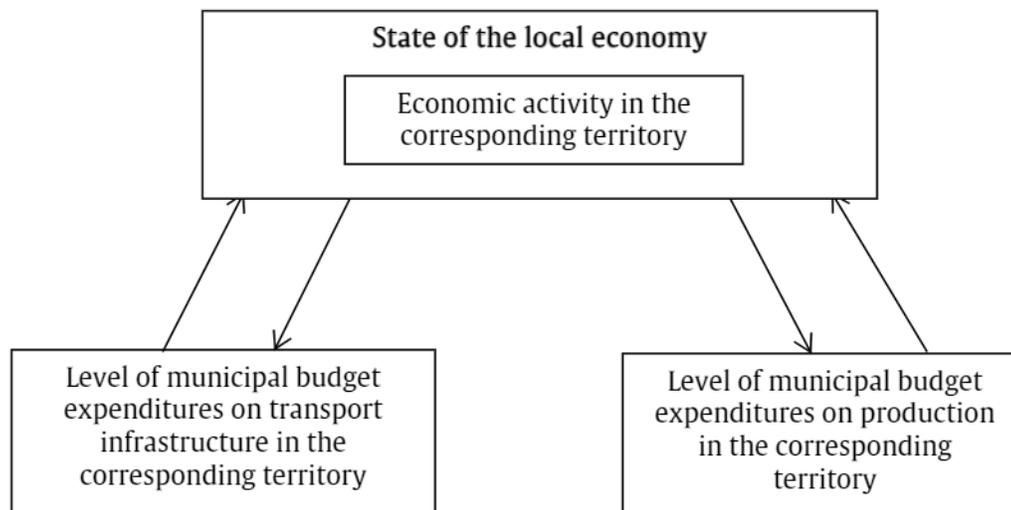
The research hypothesis, which requires empirical proof within this article, is conceptually divided into two parts: (1) determination of the comparative priority in Latvian municipal budget expenditures (it is assumed that such a determinant is the state of the local economy); and (2) the impact of 'transport' and 'production' expenses of Latvian municipal budgets on the local economy (it is assumed that in municipalities with a more developed economy it is 'transport' rather than 'production' budget expenses that are more likely to improve the local economy, and vice-versa in municipalities with a less developed economy).

In this study, the state of the territory's economy is conceptually understood through the economic activity of its population (GovPilot, 2023) as the core of the local economy, from which economic activity originates, grows, and develops in a certain territory (Capello, 2009). As already noted in the introduction, municipal budget expenditures on transport infrastructure

and production are the two factors that potentially influence the local economy, improving its condition through increasing the economic activity of the population of the corresponding territories and competing with each other for financial resources from municipal budgets. In turn, the very state of the local economy potentially influences the decision on the comparative priority in the distribution of

municipal budget expenditures between two positions – transport infrastructure and production (Aschauer, 1990; Yong, 2021).

Then, in schematic form, the conceptual model on the basis of which the empirical proof of the hypothesis of this study will be built is shown in Figure 1.



**Figure 1:** Schematic conceptual model of the relationship between the state of the local economy and municipal budget expenditures on transport infrastructure and production

Source: elaborated by the authors based on the literature review (Aschauer, 1990; Garofoli, 1993; Fujita & Thisse, 2002; Niedole & Averyanov, 2011; Yong, 2021).

The next section presents an empirical interpretation of each of the central notions contained in the schematic conceptual model that is necessary to prove the hypothesis of this study: the state of the local economy, the level of municipal budget expenditures on transport infrastructure in the corresponding territory; and the level of municipal budget expenditures on production in the corresponding territories. It also shows the tools for their measurement as well as the empirical basis of this study.

## MATERIALS AND METHODS

As already noted in the introduction to this article, the empirical basis for the study is the Basic Budget Implementation Reports submitted by Latvian municipalities to the State Treasury in 2021 and 2022 (State Treasury of Latvia, 2023), taking into account the number of inhabitants (Central Statistical Bureau of Latvia, 2023) in the

corresponding municipal territories to calculate, if necessary, per capita indicators. The administrative division of Latvia into municipal territories, consisting of 36 counties and 7 cities of national importance that are not part of the counties, is from July 1, 2021, in accordance with the Law of the Republic of Latvia "On Administrative Territories and Settlements" (Saeima of Latvia, 2020). All municipalities of Latvia, both counties and cities of national importance, were included in the study sample, which ultimately consisted of 43 objects and coincided with the population of Latvian municipalities. Such a relatively small number of objects can be analyzed by statistical methods (Kish, 1965), but requires increased attention to the statistical significance of the results obtained.

Various methods of statistical analysis will be used to achieve the goal of this study, such as frequency analysis, normality tests, and

comparison of proportions of paired samples to study the distribution of various states of the economy of Latvian municipalities, comparison of proportions of independent samples to measure the statistical significance of differences in comparative priority of municipal budget expenditures on transport infrastructure and production in groups of Latvian municipalities, and correlation analysis to study the interdependence between 'transport'/'production' expenses of Latvian municipal budgets and the state of the economy of the corresponding territories. Then, in the presence of a statistically significant correlation, regression analysis to identify a cause-effect relationship, and not just correlation interdependence, and in the absence of such, cluster analysis to identify various typological groups of Latvian municipalities according to the studied parameters will be carried out.

#### Empirical interpretation of the basic notions necessary to prove the hypothesis of this study

The state of the local economy, from less developed to more developed, in the framework

of this study, is conceptually understood through the economic activity of the population of the corresponding territory and is empirically interpreted as the amount of average annual income tax per capita credited to the municipal budgets of Latvia (Cabinet of Ministers of Latvia, 2014). The mean of the average annual income tax per capita is calculated by dividing position 1.1.1.0 "Personal income tax" in the revenue part of the budget of the Basic Budget Implementation Report (2PB\_Pasv) (State Treasury of Latvia, 2023), by the average annual number of inhabitants of the corresponding municipality (Central Statistical Bureau of Latvia, 2023).

Next, it is necessary to provide a clear empirical interpretation of which local economy, i.e., with what amount of the average annual income tax per capita, we will designate as less developed and which as more developed. To do this, it is necessary to find out the mean and median of the corresponding indicator using frequency analysis of data for 2021 and 2022.

**Table 1:** Mean and median of the average annual income tax per capita in Latvian municipalities, N = 43, 2021 and 2022

Variables	2021	2022
Mean of the average annual income tax per capita, euros	647.30	766.34
Median of the average annual income tax per capita, euros	580.34	704.75

Source: calculated by the authors using SPSS based on data from the State Treasury of Latvia, 2023.

Since the median of the average annual income tax per capita is not significantly different from its mean (Table 1), the economy of a municipality can be empirically interpreted as less developed if it has the average annual income tax per capita below the mean, and as more developed if it has the average annual income tax per capita above the mean. Since the median is still below the mean, the number of municipalities in Latvia with a less developed economy will be greater than the number of municipalities with a more developed economy.

Further, the level of municipal budget expenditures on transport infrastructure ('transport' expenses) in the corresponding territory within this study is empirically interpreted as a percentage share of budget expenditures on transport infrastructure within the total amount of its expenditures in the

current year. In turn, municipal budget expenditures on transport infrastructure will be considered the expenses included in section No 2246, "Management and maintenance of roads and streets" (in the expenditure part of the budget) of the Basic Budget Implementation Report (State Treasury of Latvia, 2023).

Finally, the level of municipal budget expenditures on production ('production' expenses) is interpreted as a percentage share of budget expenditures on production within the total amount of its expenditures in the current year. In turn, municipal budget expenditures on production will be considered the expenses included in section No. 3261, "Subsidies from the state and municipal budget for entrepreneurs," in the expenditure part of the Basic Budget Implementation Report (State Treasury of Latvia, 2023).

## RESULTS AND DISCUSSION

In accordance with the empirical interpretation of the state of the local economy presented above, the studied Latvian municipalities (N = 43 – Saeima of Latvia, 2020) are divided into two groups: municipalities with

a less developed economy (the expected majority of municipalities with the average annual income tax per capita below the mean), and municipalities with a more developed economy (an expected minority of municipalities with the average annual income tax per capita above the mean).

**Table 2:** Frequency distribution of Latvian municipalities by the state of the local economy, N = 43, 2021 and 2022

Groups of municipalities	2021*		2022**		Two-tailed significance of differences between 2022 and 2021, p-value
	Absolute values	%	Absolute values	%	
Municipalities with a less developed economy	28	65.1	26	60.5	0.250
Municipalities with a more developed economy	15	34.9	17	39.5	0.157

\* In 2021, municipalities with a less developed economy are those whose average annual income tax per capita is below the mean, i.e. below 647.30 euros, and for municipalities with a more developed economy, those whose average annual income tax per capita is above the mean.

\*\* In 2022, municipalities with a less developed economy are those whose average annual income tax per capita is below the mean, i.e. below 766.34 euros, and by municipalities with a more developed economy – those whose average annual income tax per capita is above the mean.

Source: calculated by the authors using SPSS based on data from the State Treasury of Latvia, 2023.

As data from comparing differences in the proportions of paired samples show, there is no statistically significant difference in the ratio of municipalities with less developed and more developed economies in 2021 and 2022 since the p-values for both groups of municipalities exceed the significance threshold of 0.05 (Table 2). Thus, it can be stated that the share of Latvian municipalities with a less developed economy consistently exceeds the share of municipalities with a more developed economy and amounts to more than 60% (Table 2). In turn, the probability distribution of the average annual income tax per capita in Latvian municipalities is normal: the p-value is 0.177 in 2021 and 0.151 in 2022, which indicates that the actual distribution does not differ statistically significantly from normal.

As noted in the previous section, the level of municipal budget expenditures on transport infrastructure and the level of municipal budget expenditures on production are calculated as a percentage share of total budget expenditures. Where the percentage share of budget expenditures on transport infrastructure will be greater than the percentage share of spending on

production, 'transport' expenses will be considered a comparative priority, and vice versa. The results of the frequency analysis in 2021 and 2022 showed that municipalities with a comparative 'transport' priority in budget expenditures dominate in Latvia – 31 versus 12 in both years. The comparative priorities in the pair of 'transport' and 'production' expenses of Latvian municipal budgets are stable over the two analyzed years since only 2 out of 43 municipalities changed these priorities: one municipality – from 'transport' to 'production' (Ludza county, Latgale region), and the other, on the contrary, Salaspils county, near the metropolitan area.

Having identified the comparative priorities in the pair of 'transport' and 'production' expenses of Latvian municipal budgets, we can begin to actually prove the hypothesis, although the dominance in Latvia of municipalities with a comparative 'transport' priority in budget expenditures along with the simultaneous dominance of municipalities with a less developed economy is evidence against the assumption that municipalities with a less

developed economy finance primarily production rather than transport infrastructure in their territory and vice versa.

The first way in which the hypothesis of this study can be proven or rejected is a comparison of the proportions of priorities in municipal budget expenditures between two items - transport infrastructure and production - in two groups of Latvian municipalities. In accordance

with the hypothesis of this study, it is assumed that municipalities with a comparative 'transport' priority of budget expenditures should statistically significantly prevail in the group of municipalities with a more developed economy and vice versa – municipalities with a comparative 'production' priority of budget expenditures should statistically significantly prevail in a group of municipalities with a less developed economy.

**Table 3:** Comparison\* of the proportions of priorities in budget expenditures (between transport infrastructure and production) across groups\*\* of Latvian municipalities, N = 43, 2021 and 2022\*\*\*

Comparative priority of budget expenditures (between transport infrastructure and production)	2021		2022	
	Municipalities with a less developed economy, n = 28	Municipalities with a more developed economy, n = 15	Municipalities with a less developed economy, n = 26	Municipalities with a more developed economy, n = 17
Municipalities with a comparative 'transport' priority, %	78.6	60.0	76.9	64.7
Municipalities with a comparative 'production' priority, %	21.4	40.0	23.1	35.3
Two-tailed significance of differences between two groups of municipalities, p-value	0.196		0.383	

\* To identify the statistical significance of differences in comparative priority between transport infrastructure and production of municipal budget expenditures across groups of Latvian municipalities, the method of comparing proportions of independent samples is used.

\*\* Group with a less developed economy and with a more developed economy.

\*\*\* In 2021, municipalities with a less developed economy are those whose average annual income tax per capita is below the mean, i.e. below 647.30 euros, and municipalities with a more developed economy – those whose average annual income tax per capita is above the mean, i.e. above 647.30 euros; in 2022 – below and above, respectively, 766.34 euros.

Source: calculated by the authors using SPSS based on data from the State Treasury of Latvia, 2023.

As the data presented in Table 3 show, the proportions of the comparative priorities in municipal budget expenditures ('transport' and 'production') do not differ statistically significantly from each other in the samples of Latvian municipalities with less developed and more developed economies, neither in 2021 nor in 2022, i.e. 'transport' expenses are statistically equally dominant both in the group of municipalities with a less developed economy and in the group of municipalities with a more

developed economy. Thus, by comparing the proportions of priorities in municipal budget expenditures between the two positions (transport infrastructure and production) in two groups of Latvian municipalities, the hypothesis that the state of the local economy determines the comparative priority of municipal budget expenditures is not proved.

The second way by which it is also possible to prove or reject the hypothesis of this study is to

search for a correlation between a continuous set of values of the indicator of the state of the local economy (from 358 to 1214 euro average annual income tax per capita in 2021 and from 426 to 1384 euros in 2022), on the one hand, and a set of values of a comparative priority of budget expenditures (percentage share of municipal

budget expenditures on transport infrastructure minus percentage share of municipal budget expenditures on production) on the other. The higher the first indicator, the better the state of the local economy, and the higher the second, the higher the comparative 'transport' priority of municipal budget expenditures.

**Table 4:** Correlation between the state of the economy\* of Latvian municipalities and the comparative priority\*\* of municipal budget expenditures, N = 43, 2021 and 2022

Correlated variables	Indicators	2021	2022
		Comparative priority of budget expenditures, % share	
The state of the local economy – the average annual income tax per capita, euros	Pearson correlation coefficient	-0.037	-0.082
	Two-tailed significance, p-value	0.812	0.600
	N	43	43

\* In 2021, municipalities with a less developed economy are those whose average annual income tax per capita is below the mean, i.e., below 647.30 euros, and municipalities with a more developed economy – those whose average annual income tax per capita is above the mean; in 2022 – below and above, respectively, 766.34 euros.

\*\* Calculated by the authors as the percentage of municipal budget expenditures on transport infrastructure minus the percentage of municipal budget expenditures on production.

Source: calculated by the authors using SPSS based on data from the State Treasury of Latvia, 2023.

As the results of the correlation analysis presented in Table 4 show, there was no statistically significant interdependence between the state of the local economy and the comparative priority of municipal budget expenditures in Latvia either in 2021 or 2022. For greater stability of the results obtained, the authors also checked the correlation of the state of the local economy with the percentage share of municipal budget expenditures on transport infrastructure and production. It turned out that there is also no statistically significant interdependence between these variables either in 2021 or in 2022: 0.026 ( $p = 0.867$ ) between the state of the economy and 'transport' expenses in 2021 and 0.031 ( $p = 0.844$ ) in 2022; 0.072 ( $p = 0.645$ ) or between the state of the economy and 'production' expenses in 2021 and 0.137 ( $p = 0.380$ ) in 2022.

Thus, the hypothesis that the state of the local economy determines the comparative priority of municipal budget expenditures is not proved either by comparing the proportions of priorities in municipal budget expenditures between two positions (transport infrastructure and production) in two groups of Latvian

municipalities or by analyzing the correlation interdependence between the state of the local economy and the percentage share of municipal budget expenditures on transport infrastructure and production. As a result, and in accordance with the methodology of this study, the authors conducted a cluster analysis in order to identify various typological groups of Latvian municipalities according to three parameters: the state of the local economy, measured by the average annual income tax per capita, as well as the level of municipal budget expenditures on transport infrastructure and production, measured by a percentage share of the corresponding expenditure items in the total spending of municipal budgets.

The results of the cluster agglomeration process, the first procedure in the implementation of hierarchical cluster analysis, showed that both in 2021 and 2022, the optimal number of clusters, calculated based on fixing the step in the agglomeration process after which the coefficient increases stepwise, is 4.

The main results of the cluster analysis of data for 2021 are presented in the following table.

**Table 5:** Typological groups of Latvian municipalities obtained as a result of cluster analysis, N = 43, 2021

Parameters	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Cluster name	The most economically inactive, with a relatively small 'transport' priority of budget expenditures	Municipalities with a high economic activity and a relatively large 'transport' priority of budget expenditures	Municipalities with a middle state of the economy and equal 'transport' and 'production' expenses	The most economically active, with a relatively small 'transport' priority of budget expenditures
Number of municipalities	22	3	15	3
Region where they are located	Latgale, Kurzeme	The metropolitan agglomeration	Zemgale, Vidzeme	The area near the metropolitan agglomeration
Average annual income tax per capita, euros	488.45	1023.03	694.87	1198.61
% share of budget expenditures on transport infrastructure	1.82	2.37	1.73	1.71
% share of budget expenditures on production	0.75	0.16	1.69	0.76

Source: calculated by the authors using SPSS based on data from the State Treasury of Latvia, 2023.

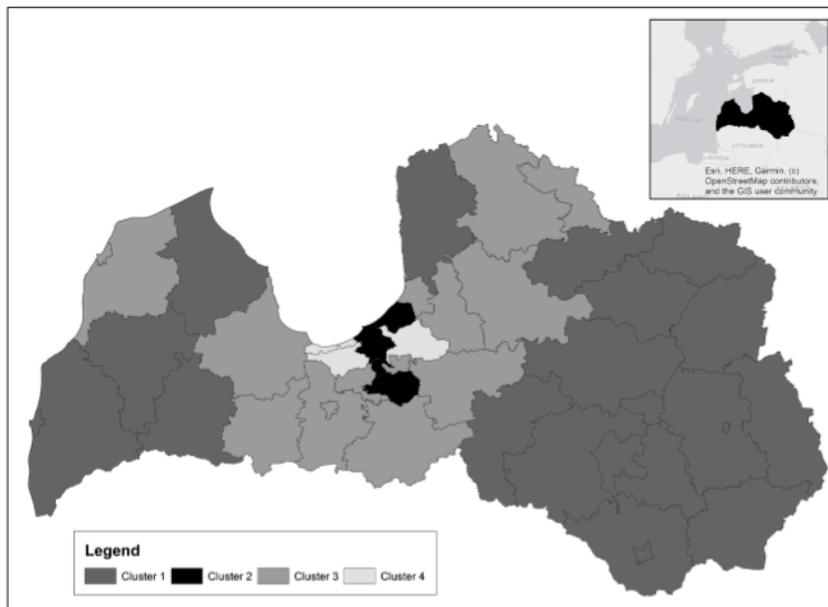
As the main results of the cluster analysis of data for 2021 show, the second and fourth small typological groups, 3 municipalities each, are similar to each other in the relatively good state of the economy. However, they differ in that in the second cluster, the transport infrastructure is greater than the priority of budget expenditures compared to production, and in the fourth cluster, the comparative priority of budget expenditures on transport infrastructure is less pronounced compared to the second cluster. The second cluster thus can be called "Municipalities with a high economic activity and a relatively large 'transport' priority of budget expenditures" (i.e., Riga city – the capital of Latvia, Adazi and Kekava counties), and the fourth – "the most economically active, with a relatively small 'transport' priority of budget expenditures" (i.e., Jūrmala city, Marupe and Ropazhi counties). All of these municipalities are located in or near the metropolitan agglomeration.

The largest typological group (22 municipalities) is the first cluster, in which

budget expenditures on transport infrastructure dominate over 'production' expenses to almost the same extent as in the fourth cluster, but, in contrast to the 4th group, these are Latvian municipalities with the least developed economies in that their average annual income tax per capita is the lowest (Table 5). These are mainly the municipalities of the Latgale and Kurzeme regions, and they are similar to the fourth cluster, "the most economically inactive, with a relatively small 'transport' priority of budget expenditures."

Finally, the third typological group, consisting of 15 municipalities, can be called "municipalities with a middle state of the economy and equal 'transport' and 'production' expenses" (Table 5).

For clarity and better spatial perception of the results of the cluster analysis of data for 2021, the membership of each municipality of Latvia in one or another cluster (its typological group) is shown in the following figure.



**Figure 2:** Cluster\* membership of Latvian municipalities according to the state of the local economy and the level of municipal budget expenditures on transport infrastructure and production, N = 43, 2021

\*Cluster 1 – the most economically inactive, with a relatively small 'transport' priority of budget expenditures;

Cluster 2 – municipalities with high economic activity and a relatively large 'transport' priority of budget expenditures;

Cluster 3 – municipalities with a middle state of the economy and equal 'transport' and 'production' expenses;

Cluster 4 is the most economically active, with a relatively small 'transport' priority in budget expenditures.

Note: Latvia borders on Lithuania in the south, Belarus in the southeast, Russia in the east, and Estonia in the north.

Source: made by the authors in the ArcGIS program based on the results of cluster analysis of State Treasury of Latvia data, 2023.

The main results of the cluster analysis of data for 2021, which captured certain dynamics in the 'transport and production' economic structure of

the territories of Latvia, are presented in the following table.

**Table 6:** Typological groups of Latvian municipalities obtained as a result of cluster analysis, N = 43, 2022

Parameters	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Cluster name	The most economically inactive, with a middle 'transport' priority of budget expenditures	The most economically active, with a relatively large 'transport' priority of budget expenditures	Municipalities with a middle state of the economy and a relatively small 'transport' priority of budget expenditures	Municipalities with relatively high economic activity and 'production' priority of budget expenditures

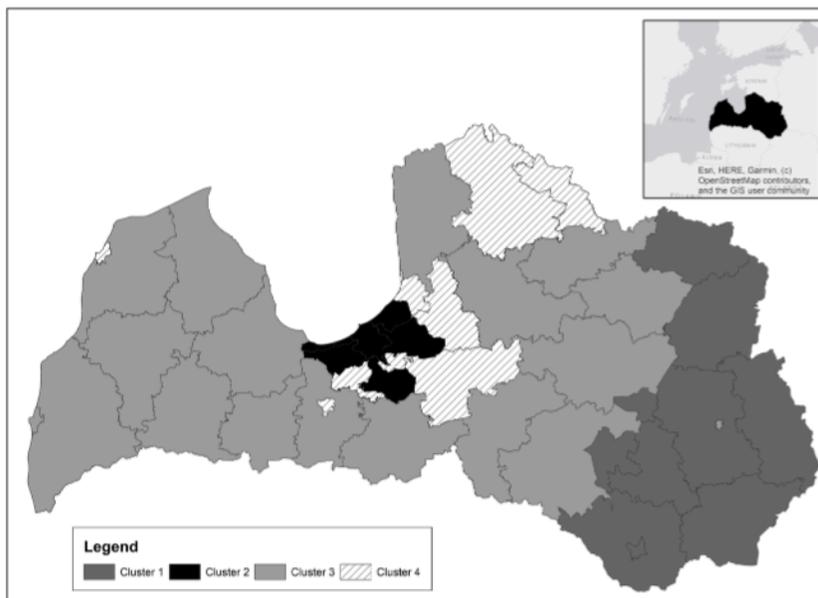
Table 6: Continued

Number of municipalities	10	6	18	9
Region where they are located	Latgale	The metropolitan agglomeration and the area near it	Kurzeme, Zemgale, Vidzeme	The area around Cluster 2, the north of Latvia (in Vidzeme)
Average annual income tax per capita, euros	506.9	1219.97	686.90	911.77
% share of budget expenditures on transport infrastructure	1.66	2.02	1.81	1.42
% share of budget expenditures on production	0.49	0.63	1.17	1.95

Source: calculated by the authors using SPSS based on data from the State Treasury of Latvia, 2023.

For clarity and better spatial perception of the results of cluster analysis of data for 2022, the belonging of each municipality of Latvia to one or

another cluster (typological group) is shown in the following figure.



**Figure 3:** Cluster\* membership of Latvian municipalities according to the state of the local economy and the level of municipal budget expenditures on transport infrastructure and production, N = 43, 2022

\*Cluster 1 – the most economically inactive, with a middle 'transport' priority of budget expenditures;  
Cluster 2 – the most economically active, with a relatively large 'transport' priority of budget expenditures;

Cluster 3 – municipalities with a middle state of the economy and a relatively small 'transport' priority of budget expenditures;

Cluster 4 – municipalities with relatively high economic activity and 'production' priority of budget expenditures.

Note: Latvia border with Lithuania in the south, Belarus in the southeast, Russia in the east, and Estonia in the north.

Source: made by the authors in the ArcGIS program based on the results of cluster analysis of State Treasury of Latvia data, 2023.

As the main results of the cluster analysis of data for 2021 and 2022, presented in Tables 5 and 6 and Figures 2 and 3, show, the following noteworthy changes occurred in the studied clusters over the year, which may indicate an ongoing 'transport-production' economic restructuring in Latvia:

- 1) The number of participants in the first cluster of the most economically inactive municipalities, with a relatively small (initially) 'transport' priority of budget expenditures, decreased by 2 times (only Latgale municipalities remained in it), and the gap between the percentage share of 'transport' and 'production' expenses of municipal budgets increased from 2.5 times up to 3 times;
- 2) Two small clusters in 2021, each of which had 3 municipalities ("municipalities with a high economic activity and a relatively large 'transport' priority of budget expenditures" and "the most economically active, with a relatively small 'transport' priority of budget expenditures") merged into one cluster, now consisting of 6 municipalities. The main result of this merger (in the context of this study) was the accumulation of their most characteristic features – high economic activity and the priority of 'transport' expenses - and now this cluster can be called "the most economically active, with a relatively large 'transport' priority of budget expenditures". It is interesting that in terms of the priority of 'transport' in budget expenditures, this cluster with the most developed economies has become similar to the cluster of municipalities with the least developed economies, since in both groups the percentage share of 'transport' expenses is almost 3 times higher than the percentage share of 'production' expenses of municipal budgets;
- 3) In the third cluster, which remained practically unchanged in terms of the number of participants, the equality of financing of transport infrastructure and production was violated in favor of 'transport' expenses of municipal budgets, and so now this group can be called "municipalities with a middle state of the economy and a relatively small 'transport' priority of budget expenditures". The territory of this cluster was replenished mainly by municipalities of the Kurzeme region, which were included in the first cluster in 2021;
- 4) A typologically new cluster of Latvian municipalities has emerged, distinguished primarily by the fact that the percentage share of budget expenditures of its participants (9 municipalities) on production exceeds the percentage share of expenditures on transport infrastructure (1.95% and 1.42%, respectively). The state of the economy in these municipalities is relatively good - 2nd place among the four clusters - and territorially, this cluster consists mainly of those municipalities that 'border' the second merged cluster (the most economically active, with a relatively large 'transport' priority of budget expenditures), and are also localized in the northern part of Latvia.

During the study, the authors did not examine the impact of regulatory policies at the local and state levels. For expenditures on the development of transport infrastructure and production, the effectiveness of these investments can be monitored and evaluated, however, the non-monetary consequences of regulatory policies on the economy are not calculated at the level of expenditure items of local budgets. At the same time, their influence can be very significant. For example, the impact of the provision of tax benefits (reduction of income tax, reduction of the land tax rate or postponement of VAT payment when modernizing equipment used in production) can significantly stimulate the development of the economy in certain industries or municipalities. Given the study's findings, future research efforts could focus on developing methodologies or frameworks for evaluating non-monetary effects, particularly in the context of local and state regulatory environments. This could involve case studies or pilot programs that

examine the outcomes of specific regulatory changes, such as tax benefits, on local economies and municipal budgeting practices.

### CONCLUSIONS

In the international scientific space, the importance of transport infrastructure for economic growth, economical and long-term development, and the economic performance of territories is being actively studied, as well as, but to a much lesser extent, the importance of production for all of the above, especially for territories with a less developed economy where industrialization is still the most important driver of economic growth. Based on a review and analysis of the results of studies already conducted, the authors hypothesized that the comparative priority in municipal budget expenditures between two items - transport infrastructure or production - is determined by the state of the local economy. Furthermore, the authors suggested that in municipalities with a more developed economy, it is 'transport' rather than 'production' budget expenses that improve the local economy, and in municipalities with a less developed economy it is the opposite. The authors tested this hypothesis based on empirical data for 2021 and 2022 for 43 Latvian municipalities using various methods of statistical analysis.

The main conclusion that can be drawn from the results of the empirical data analysis is the following: the comparative priorities in budget expenditures of Latvian municipalities are determined not by the state of the local economy and do not influence its state, but rather by the geographic or geopolitical/geoeconomical location of the municipality. Thus, they are spatially determined by the need to maintain and improve transport infrastructure or support and develop production. This finding suggests that future research could explore how specific geographic or geopolitical/geoeconomical factors, such as proximity to major economic centers or borders, influence municipal budgeting decisions and priorities. This aspect is particularly relevant when considering regulatory policies at the local and state levels, as these policies might be tailored or varied based on geographic or geopolitical/geoeconomical considerations.

Latvian municipalities were grouped into territorial clusters, using the agglomeration effect (Fujita & Thisse, 2002) from the concentration of

transport infrastructure or production, which is more pronounced in 2022. This observation could lead to the recommendation that policymakers and planners consider cluster-based approaches in their economic development strategies. Such strategies could include targeted regulatory policies designed to bolster the strengths of each cluster of municipalities, whether in transport infrastructure or production, to stimulate economic growth and development more effectively.

Over the past year, there has been a tendency towards even greater economic isolation of the south-eastern region of Latvia – Latgale – from the rest of its territory, the emergence of a compact block of 'producing' municipalities with a preference for supporting production over the development of transport infrastructure, as well as the strengthening of the cluster located in the center of Latvia in and around the metropolitan agglomeration and consisting of the most economically active 'transporting' municipalities. Such trends may indicate an ongoing 'transport-production' economic restructuring of territories in Latvia, the reasons for which require further study, but it can be assumed that the current geopolitical situation in Eastern Europe plays a major determining role in this process.

Given the importance of transport infrastructure highlighted in the study, an additional conclusion could emphasize the strategic value of integrating Latvian transport infrastructure with broader European networks. This aspect is particularly relevant when considering the geopolitical/geoeconomical situation in Eastern Europe. Future recommendations could advocate for policies that facilitate such integration, potentially attracting more significant investment and stimulating economic development at both local and national levels.

### ACKNOWLEDGMENTS

The article was developed within Daugavpils University's (Latvia) research project "Developed Transport Infrastructure and Developed Industry: What Is Primary for the Development of a Territory?", Nr. 14-95/2023/5.

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