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Urban-rural spatial interaction (on the example of Kazan and the surrounding area)

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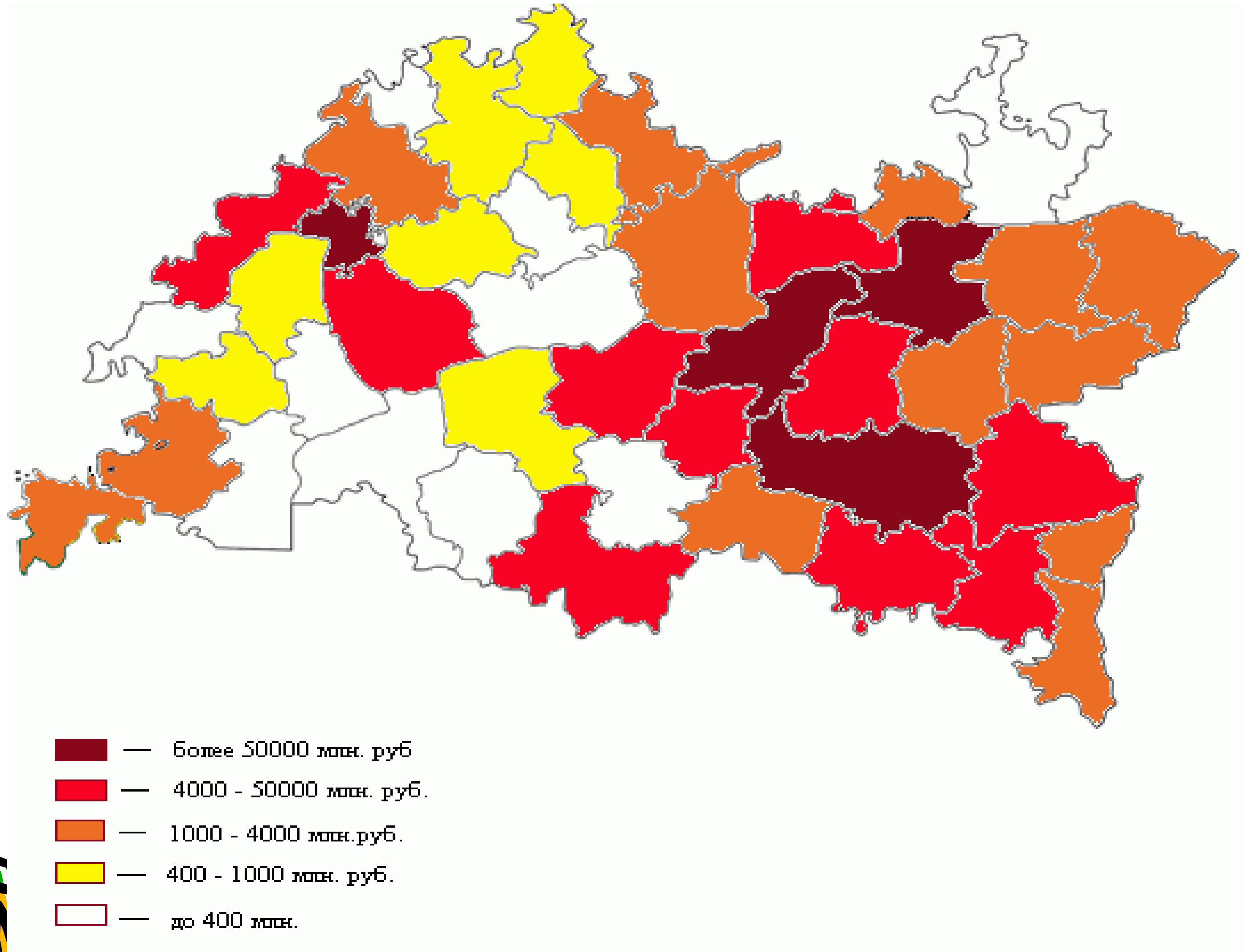
The aim of this presentation is to evaluate the city-village interaction on the base of Moran's I

$$I = \frac{n\sum\sum w_{ij}\left(x_i - \bar{x}\right)\left(x_j - \bar{x}\right)}{w\sum\left(x_i - \bar{x}\right)^2}$$

Tatarstan: GRP in 2009 (municipal level)



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Understanding urban-city interaction is highly significant…

- spatial autocorrelation is present in the data
- there is a clear geographic clustering of economic activity: high growth rates are found in those regions that have neighbors with high growth rates
- Cities play an important role in economic growth

GRP: Cities share in Tatarstan GRP

	2009	2004
Almetevsk	30%	20%
Nijnekamsk	22%	20%
Nab. Chelni	15%	10%
Kazan	17%	30%

Study area:

Kazan is a large industrial city located in the European part of Russia, and is the capital of the Republic of Tatarstan. Its population is over 1 million.

Its mission is to disseminate prosperity to its rural hinterland.

Kazan has borders with 5 rural districts (its direct neighbours): Verkhneuslonsky, Vysokogorsky, Zelenodolsky, Laishevsky and Pestrechinsky

Different economic data (such as GDP, retail, volume of total service, revenue of enterprises and etc.) was tested for spatial autocorrelation - Moran's I

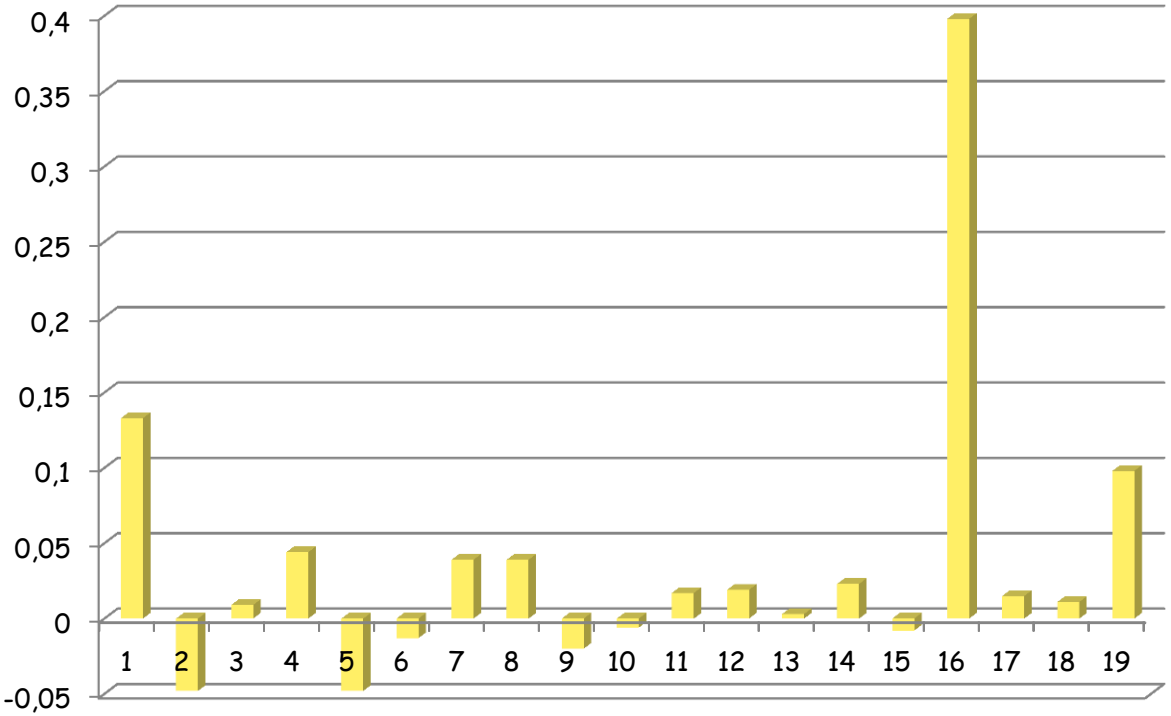
Modeling spatial dependencies begins with the construction of spatial weights matrices

First, a contiguity matrix was applied:

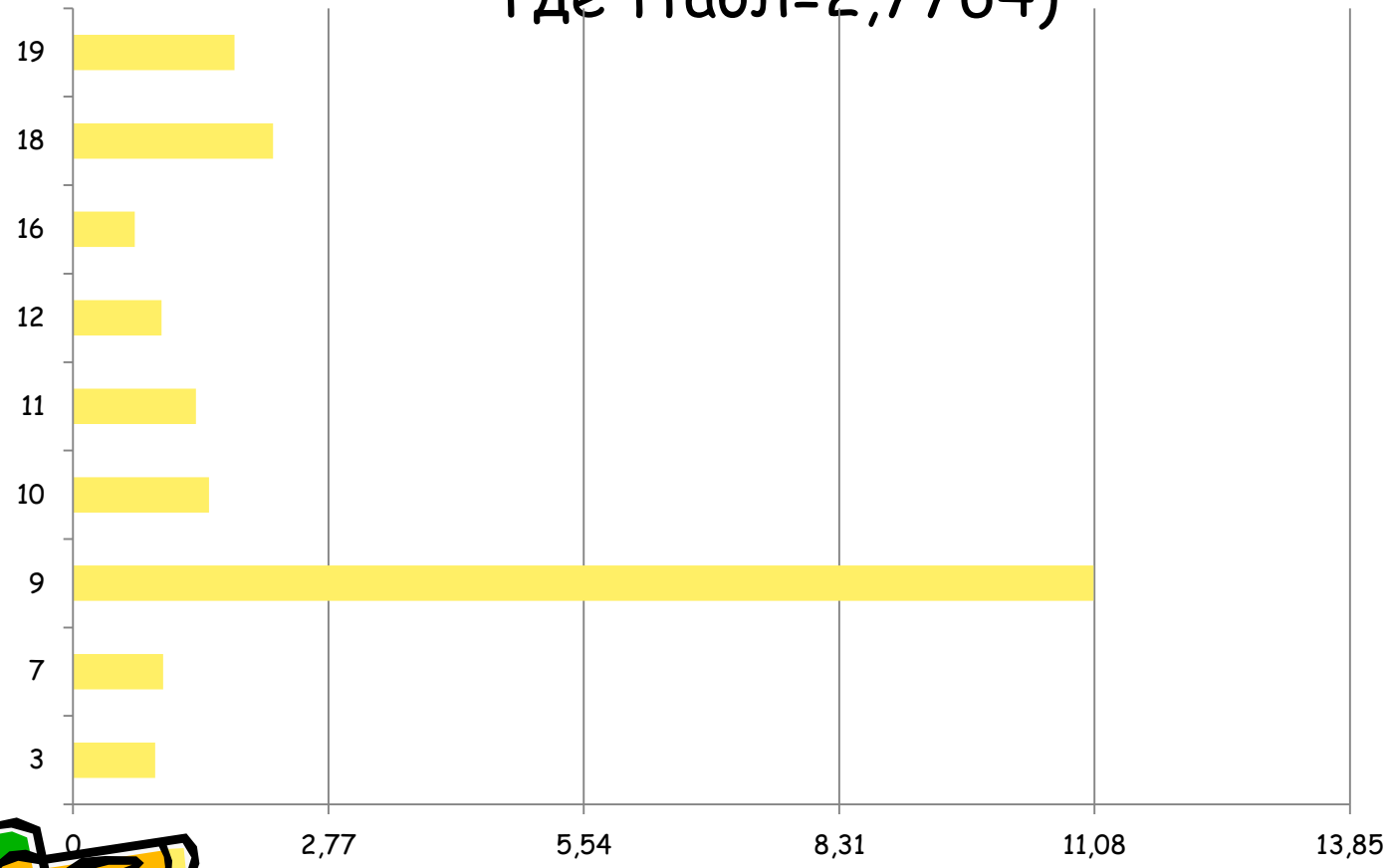
$$w_{ij} = \begin{cases} 0, & \text{если } i = j \\ 1, & \text{если } j \text{ граничит с } i, \\ 0, & \text{в обратном случае} \end{cases}$$

Calculation of Moran's I

Indicators of spatial autocorrelation



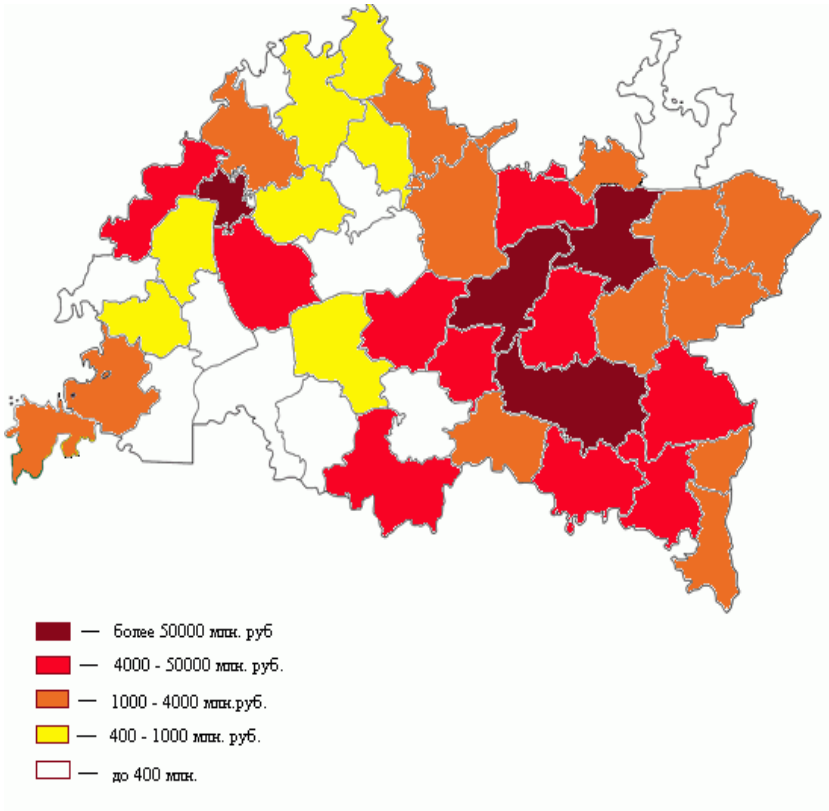
Then we tested each variable for regression (with economic growth rate) and their significance on a base of t-statistics (Student criterion) (tрасч>tтабл, где tтабл=2,7764)



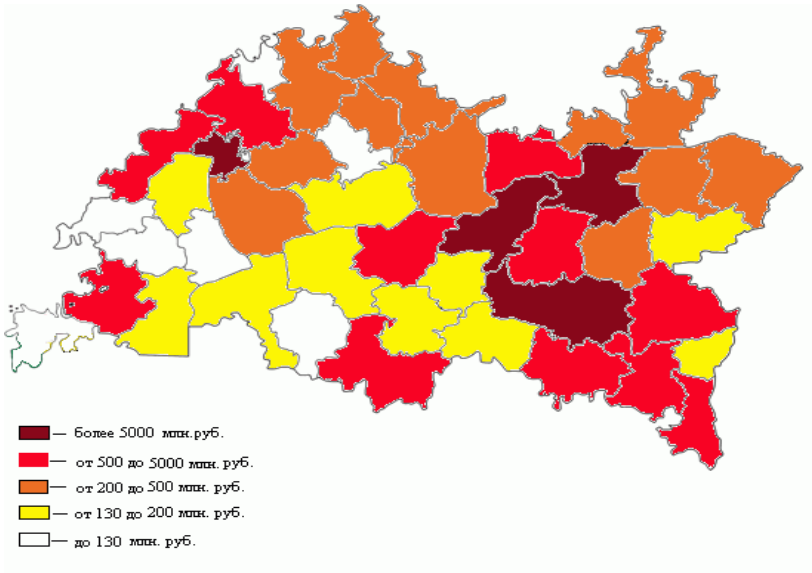
The Regression Analysis has shown that the economic growth rate of Tatarstan depends on only one factor – the total volume of services

According to the maps, some interesting conclusions can be made.

GRP distribution



Distribution of services



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Economic growth model: growth rate is a function of expenditures on services

$$y_x = 0,169 + 0,217x$$