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Socio-economic factors of automobile air pollution in Russian cities

Atmospheric air pollution in large Russian cities is one of the most pressing and urgent problems of sustainable development of the country. According to Roshydromet, the air quality in 40 Russian cities is currently assessed as highly polluted. The road transport is one of the main sources of atmospheric pollution. Thus, in 2018 automobile exhausts accounted for 46.7% of all harmful air emissions.

This study is devoted to assessing the relationship between air pollution by automobile transport and economic development in large cities of Russia is carried out within the Kuznets Environmental Curve hypothesis (EKC) testing. The EKC is a hypothetical model describing the nexus between pollution and economic growth. This model declares an increase in environmental pollution with economic growth, but only up to a certain point, after which, with further economic development, a gradual decrease in the negative environmental load begins due to the development of technology and institutions. So, the designated relationship has the functional form of an inverted U-shaped curve [1]. A review and critique of some works on this topic is presented in [2,3,4].

The relationship between air pollution from cars and socio-economic development of large Russian cities was evaluated as part of the EKC hypothesis test for panel data containing 56 Russian cities with a population of more than 300 thousand people in the period from 2013 to 2018. The hypothesis was tested by thecregression modeling: eight models were built for the emissions of seven motor vehicle pollutants and aggregate car emissions. Some estimate of Gross Municipal Product (GMP) per capita was used as a measure of economic growth. Additional indicators of infrastructure and social development were also included in the regression models, including: population, population density, road network density, number of gas stations per capita, share of the agricultural sector, environmental costs per capita, and cost of gasoline.

We use log-level models of panel data with a fixed-individual effect. The first, second, and third degree values of the per capita GMP indicator were included in the specification. This specification allows to estimate the shape of the functional relationship between the variables. A total of eight were tested. Next, the sample of cities was divided into three subgroups: relatively small, medium, and larger cities, in order to better analyze additional effects (other than per capita GMR). For each of the subgroups, additional regressions, similar to those previously described, were constructed. Naturally, with minor changes consisting in the exclusion of the population indicator and the per capita GMP.

According to the results obtained, we can conclude that the functional relationship between automobile emissions and econom ic growth of large Russian cities has the character of an N-shaped curve, the EKC hypothesis, implying the dependence in the form of an inverted U, is rejected. Our results can be interpreted as follows: as economic development in the large cities of Russia, there is an increase in emissions from motor transport, probably due to the expansion of the car fleet. Then, after reaching a certain level of prosperity, the growth of emissions slows down and slightly decreases, this may be due to the fact that in more developed cities, most motorists are able to buy new cars, which are also more environmentally friendly. However, subsequently, with economic growth, emissions from motor vehicles begin to rise again. Perhaps, the level of motorization of the population continues to increase faster, and the indicated positive effects are insufficient. Thus, we can conclude that the negative effects of transport activity in Russia are not reduced with the development of the economy, it is necessary to apply command and control and economic methods of regulation. According to additional results of the analysis, population growth has a strong positive effect on increasing motor vehicle pollution; an increase in population density leads to an increase in motor vehicle pollution in large cities, and in contrast, the opposite effect is

observed in small cities; an increase in road network density is an important factor in reducing emissions in major cities; an increase in gasoline costs leads to lower emissions from vehicles.

Reference

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