

Reducing the negative impact of motor transport on the environment: prospects for the use of fiscal instruments in Russia

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Abstract

The study focuses on the fact that, in major Russian cities, up to 80% of the negative impact on the environment is formed by motor transport emissions. The authors analyze the indicators of the negative impact due to the forced increase in the Russian fleet and the age pattern of the Russian fleet is researched. The proposed paper argues the conclusion that fleet capacity leads to an increase in its quantitative indicators, but does not lead to a rapid displacement of cars with the environmental classes 1 and 2. In Russia, the share of these vehicle classes continues to be very high. The presented research analyzes the reasons for the conservation of the unsatisfactory environmental Russian fleet structure. The conclusion is proved that one of the significant reasons for the continued manufacturing and consumption of low environmental class vehicles is the lack of real tax incentives. The authors analyze the fiscal payment's system in the production and consumption of vehicles. It is concluded that these payments do not depend now on the environmental performance of the vehicle. The research paper introduces the renewed combination of tax instruments, the implementation of which will encourage producers and consumers to produce and purchase cars of a higher environmental class. The presented paper provides producers to make the excise tax on the car sale and disposal charge to be dependent on engine power and environmental class. The authors argue that the higher costs will be made up by the manufacturers' lower tax payments. As a result, it will not lead to a sharp increase in car prices. For consumers it is proposed to modify the transport tax, the value of which should be dependent on the environmental class of the car. Environmentally-oriented



transport tax will stimulate consumers to purchase cars of a higher environmental class with the expectation that their higher costs will be paid off later with lower tax payments.

Keywords: road network, auto transport, environment, transport taxes, environmental class, ecologization.

1 Introduction

Russia is the largest country on the planet. The length of Russian territory from north to south is over 4 thousand kilometers, from east to west – 10 thousand kilometers; the whole area is 17 million square kilometers. A developed road network and large car fleet is an inherent part of the interregional cooperation and mobility of labor for a country that has such distances. In general, a high-quality road transport system is the basis for economic security and a guarantee of the preservation of the country's integrity as a single state.

The existing road network in Russia cannot be characterized as qualitative, and the car fleet is not modern and large. The data of the road network rating, which is compiled by the World Economic Forum, is the proof of this. According to this ranking, the quality of roads Russia ranks only 136th of 144 in the world (international experts evaluated the quality of Russian roads only 2.3 points out of 7) [1].

The thesis of the lack of development of the Russian car fleet is supported by the comparative data on the level of motorization. While in the United States there are 640 passenger cars per 1000 residents, in the developed European countries – an average of 500 cars per 1,000 residents, in Russia there are only 260 cars per 1,000 residents. The number of passenger vehicles per thousand people in Russia is 3 times lower than in the United States and almost 2 times lower than in France, Japan, Germany and the UK.

Bad roads and poor fleet imposes serious constraints on increasing the competitiveness of the Russian economy. In particular, the mobility of the population of Russia is almost 2.5 times lower than in other developed countries. In addition, there is an unreasonable increase in the share of transport costs in the cost of all the products produced in the country. In particular, the share of the transportation costs in the industry is about 10–15%; in construction it reaches 20%; in agriculture and trade it's more than 30%.

The problem of the lack of development of the Russian car fleet is compounded by a large share of its older cars that have a high negative impact on the environment. At the beginning of 2014 the share of cars under 5 years old was 28%, from 5 to 10 years – 22%, and over 10 years – almost 50%. Half of the Russian car fleet is classified as Euro-2 and Euro-1, which has a very negative impact on the environment. Poor age structure of the car fleet has a particularly negative impact on the ecology of large Russian cities, in which the motor vehicle emissions reach 60–80% of the total emissions of pollutants in the atmosphere [2, 3].



The continuation of these conditions actualize the problem of finding fiscal stimulus of production and consumption of the new cars with a higher environmental class.

2 Analysis of the Russian car fleet and the negative impact of transport on the environment

Despite the validity of the thesis of the lack of development of the Russian car fleet, it must be admitted that the Russian car fleet increases rather rapidly. During the period from 1995 to 2012, the number of vehicles has increased more than 2.5 times (Table 1) [2, 3]. However, there is a very significant lag in the development of the road network. During the same time period of time, the length of the paved roads increased only 1.2 times. It should also be noted, the number of vehicles owned by the citizens is increasing rapidly, so the growth of emissions and environmental damage is not accompanied by an increase in payments for pollution.

Table 1: Dynamics of the Russian car fleet, thousand units.

Indicator	1995	2000	2005	2010	2012	Increase, %
Availability of vehicles (by the end of the year)	17 645	24 993	30 803	40 662	44 543	252
Including: owned by citizens	14 486	20 792	2 6684	36 007	40 190	277
trucks	2 937	4 122	4 564	5 414	5 751	196
Including: owned by citizens	798	1 548	2 265	2 950	3 273	410
Buses	513	624	778	894	902*	176
Including: owned by citizens		183	331	428	440*	240
passenger cars	14 195	20 247	25 461	34 354	38 792	273
Including: owned by citizens	13 688	19 061	24 088	32 629	36 917	270
<i>For reference:</i>						
<i>The length of roads, th. km.</i>	<i>940</i>	<i>898</i>	<i>858</i>	<i>1004</i>	<i>1283</i>	<i>137</i>
<i>including paved roads, th.km.</i>	<i>750</i>	<i>752</i>	<i>724</i>	<i>786</i>	<i>928</i>	<i>124</i>

Note * – data for 2011.

The positive dynamics of the Russian car fleet is not accompanied by an equally rapid improvement in its age structure (Table 2) [2, 3]. In the period of 2000–2012, the proportion of new cars (up to 5 years) increased by only 7%. An increase in the proportion of very old cars (over 10 years) to nearly 50% of the total car fleet should be regarded as a negative trend. These cars are dangerous, both in terms of ecology (all of them are basically of 2 and 1 environmental classes), and in terms of safety (most of them are not even equipped with air bags).

Table 2: Age structure of the car fleet in Russia, %.

Type of vehicle	2000	2005	2010	2012	Increase, %
Passenger cars being in service	100	100	100	100	
Up to 5 years	20.6	21.7	27.2	27.4	6.8
from 5 to 10 years	32.2	27.7	24.6	22.8	-9.4
over 10 years	47.2	50.6	48.2	49.8	2.6
Buses being in service	100	100	100	100	
Up to 5 years	19.3	26.2	24.9	23.1*	3.8
from 5 to 10 years	37.5	26.8	28.6	28.4*	-9.1
over 10 years	43.2	47.0	46.5	48.5*	5.3
Trucks being in service	100	100	100	100	
Up to 5 years	14.4	14.0	17.0	17.0*	2.6
from 5 to 10 years	34.8	23.5	19.0	18.6*	-16.2
over 10 years	50.8	62.5	64.0	64.4*	13.6

Note * – data for 2011.

Analysis of pollutant emissions into the atmosphere shows that, in general, during the period of 1995-2012 these emissions have not increased. However, the structure of the emissions changed. The share of vehicle emissions in the total emissions in Russia has increased to 39% (Table 3) [2, 4].

Table 3: Dynamics of pollutant emissions into the atmosphere.

Indicator	1995	2000	2005	2010	2012	Increase,%
Emissions of pollutants into the atmosphere, million tons	32.3	32.3	35.8	32.7	32.3	100
Emissions of air pollutants from stationary sources, million tons	21.3	18.8	20.4	19.1	19.6	92
Emissions of air pollutants from motor vehicles, million tons	11	13.5	15.4	13.6	12.7	115
Share of vehicle emissions in the total emissions of pollutants into the atmosphere	34.06	41.80	43.02	41.59	39.32	115
Emissions of pollutants from motor vehicles per unit of land area, t/km ²	0.64	0.79	0.90	0.80	0.74	115

The most significant contribution to the increase of emissions has been made by old cars. It is obvious that the old cars need to be gotten rid of. The most effective tool is a fiscal impact on car owners.

3 The current system of fiscal payments over the life cycle of the vehicle

The life cycle of the vehicle is the period of time from its production to disposal. Accordingly, this cycle is split into three main stages: production, use and disposal. It is proposed to analyze the use of different fiscal payments in relation to each stage of the life cycle of the vehicle (see fig. 1).

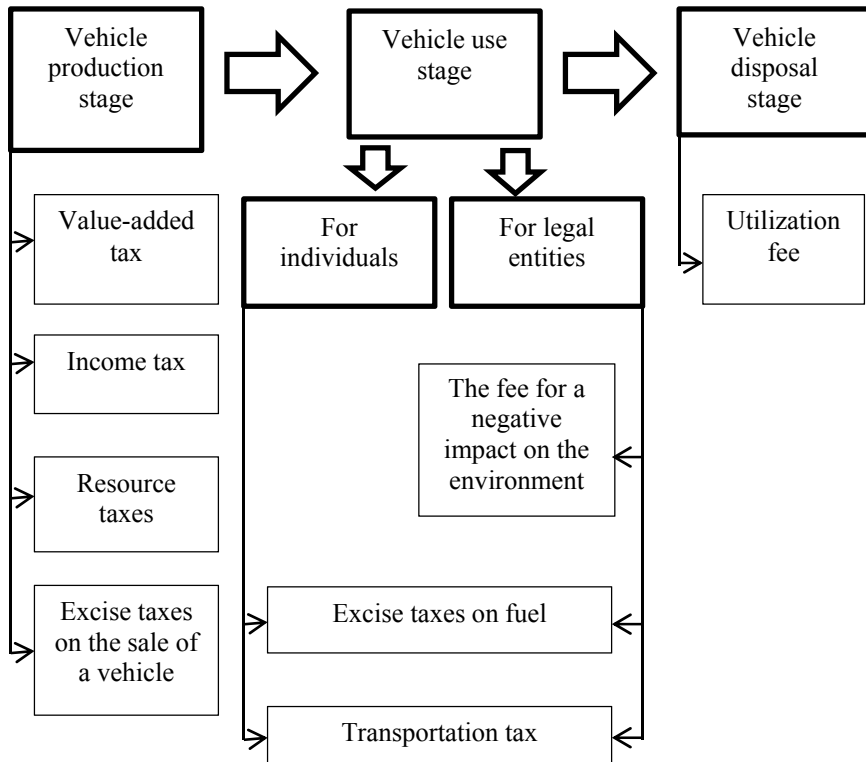


Figure 1: Types of fiscal payments over the life cycle of the vehicle.

A brief description of each fiscal payment specifics for the purposes of development of the road network and ecologization of the environment.

1. *Vehicle production stage.* At this stage, the manufacturer shall pay all taxes and other obligatory payments to the budget. The most important of them are: the value added tax, income tax, resource tax (on water, land, mineral extraction). All of these payments are also characteristic of other types of industries.

Excise tax on the sale of the vehicle is the specific payment of this stage. Excise taxes are paid by the manufacturer (or importer – when importing cars) on the sale of cars with engine capacity of more than 90 horsepower and

motorcycles with engine capacity of over 150 horsepower. At the same time sales of trucks and buses are not subject to excise taxes. The rate of excise is progressive. It is \$ 1.0 per 1 horsepower if the power of the car ranges from 90 to 150 horsepower and \$9.5 per 1 horsepower if the power of the car is more than 150 horsepower.

All payments on the production stage do not have the targeted nature and go to the general budget of the state. They have nothing to do with the objectives of the road transport system development and ecologization of the environment.

2. *Vehicle use stage.* Set of the fiscal payments on this stage varies depending on who uses the vehicle. And the difference is quite fundamental. The difference concerns the fact that organizations operating vehicles pay for the negative impact on the environment. And individuals using vehicles do not pay for that. These payments are designed to compensate for the amount of the damage of environment during the use of the vehicle. But actually there is no such compensation. Payments are significantly lower than the amount of damage caused. Other payments from individuals and legal entities are identical. They all pay transportation tax and the excise tax on fuel.

Transportation tax is essentially a tax on the possession of the vehicle, i.e., has the characteristics of a property tax. It is computed depending on the engine power (in horsepower). Rates vary by the type of vehicle: passenger cars, trucks, buses, motorcycles, etc. Rates have a substantial progression. This progression is more significant for passenger cars. If engine power increases 2.5 times (from 100 to 250 horsepower), the tax rate for the passenger car increases 6 times, and for the truck – only 3 times. This approach to the differentiation of rates does not account for age and environmental class of the car. It also does not take into account the increased load of trucks on the road surface. Transportation tax is a regional tax and fully credited to the regional budget. It is not a targeted tax, and therefore is spent on the general needs of the region. Regions have the right to increase or decrease the rate of vehicle tax 10-fold.

Excise taxes on fuel are paid by the manufacturer and are included in the price of fuel. Excise rates are already differentiated by environmental classes of fuel. They are highest for class 3 fuel of and minimal for the class 5 fuel. The difference between these rates is quite remarkable. For example, the rate for class 3 gasoline is 1.7 times higher than the rate for class 5 gasoline. This differentiation should encourage manufacturers to produce fuels of higher environmental classes.

Excise taxes on fuel are designed to establish the correlation between the amount of mileage of the car and the financial participation of the owner in the financing of roads in the region where the fuel was purchased. Excise taxes on fuel are accumulated in the federal budget and are distributed between regions for the purpose of road construction. These funds are distributed in proportion to the volume of fuel consumed within these regions. So there is a stable correlation between fuel consumption in the region and the use of the road network in the same region. Advantage of the excises is that they take into account the complex environmental properties of the consumed fuel and thus correlate with the use of the road network by car owners.



Legal entities are also required to pay a fee for the negative impact on the environment. Payments are made for different kinds of effects: for the release of air pollutants, for the discharge of pollutants into water bodies, for the pollution of subsoil and soil, disposal of production and consumption waste, pollution noise, heat. The main negative effects of vehicles are: emission of air pollutants and noise. Taxpayer is responsible for calculating the payment. The main advantage of this payment is that it has a compensatory nature and is a form of compensation for economic losses due to the negative impact on the environment. The disadvantage is the complexity of the calculations and their coordination with the supervisory authority, as well as a limited number of taxpayers. In particular, individuals and individual entrepreneurs do not make the payment.

3. *Vehicle disposal stage.* Utilization fee was introduced in Russia for all wheeled vehicles. Fee shall be paid to the budget before setting the vehicle on the public record. It guarantees the owner a utilization of car at the end of its use. Fee is paid by vehicle manufacturers or importers. The fee is differentiated for different types of vehicles: cars (\$600), trucks (\$4,300). Furthermore, there is a stimulating rate that reduces the fee up to 10 times for new cars (up to 3 years).

Table 4: Accordance of the existing fiscal payments over the life cycle of the vehicle with the objectives of the road network development and the ecologization of the environment.

№	Payment	Implementation of the objectives	
		Road network development	Ecologization of the environment
1	Value-added tax	-	-
2	Income tax	-	-
3	Resource taxes	-	-
4	Excise taxes on the sale of a vehicle	-	-
5	Fuel excise taxes	+	+
6	Transportation tax	-	-
7	Fee for a negative impact on the environment	-	+
8	Utilization fee	-	+

Out of these eight types of payments, the first three are general taxes that are applied to all activities. They may not have the needed accordance. But five other payments are specific to the use of motor vehicles, and the connection with the objectives of the road network development and the ecologization of the environment is noticeable. However, in some specific payments this connection is absent.

4 Theoretical grounds of ecologization of transportation taxes

In our opinion, all the specific fiscal payments for motor vehicles (hereinafter – the group of transport taxes) should implement:



a) *fiscal function*, i.e. to have a significant distributive and allocative potential. It is about giving the transport taxes the ability to correct the market failure in the area of financial resourcing of construction and repair of roads. The market fails to ensure the development and use of the road network on the principles of individual retribution and equivalence. This task is taken over by the state and is solved by introducing a group of transport taxes. With the help of transport taxes the government should accumulate a significant portion of the financial resources of the population and businesses in the budget and target these resources to focus on the development of the road network. Accordingly, the fiscal purpose of transport taxes should ensure the targeted provision of financial resources to road construction funds, and these resources should be sufficient for road construction. In addition, all users of the road network should participate in its funding;

b) *regulatory function*, i.e. to have a significant regulatory and behavioral potential. In an aspect of the implementation of this function, transport taxes should encourage economic agents to be environmentally responsible while using motor vehicles. There should be an effort to buy a car of a higher ecological class and use fuel of higher ecological class. Transport taxes should not discourage the desire of economic agents to use vehicles. This rule should be more common in countries where the main mean of transportation is a car.

Through the simultaneous implementation of fiscal and regulatory functions, the transport taxes embody the idea of a double dividend, where environmentally oriented behavior of car owners will be accompanied by the formation of stable revenue sources for road construction and environmental protection.

The need to address the regulatory function of the transport fees and the use of fiscal instruments for the promotion of environmentally-oriented behavior of producers and owners of vehicles and related products is recognized by most analysts and researchers [5–9].

To implement these functions more effectively, it is proposed to implement the ecologization of transport taxes. To do this, it is proposed to make transport tax rates contingent on the environmental class of the car to increase the tax burden on manufacturers and owners of cars of low environmental classes. In addition, it is proposed to establish a strictly targeted use of transport taxes for the development of the road network.

5 Suggestions for ecologization of transport taxes

Excise taxes on the sale of a vehicle should be differentiated according to environmental classes as follows: for class 5 cars excise rate remains unchanged, i.e., the ratio = 1. For class 4 cars, an operating excise tax rates should be increased 5 times, and for class 3 cars – 10 times. Furthermore, zero rate for low-power cars (up 90 horsepower) should be removed, and the current rate of excise should be used on them. This suggestion is focused on the domestic car manufacturing market. Since 2014, it is permitted to import only class 5 cars to Russia, while domestic manufacturers, primarily concern Lada, still produces vehicles of 3rd and 4th environmental classes, a large proportion of which

applies to cars with a capacity of less than 90 horsepower. Excise tax on the sale should be extended also to trucks.

Transport tax should be differentiated as follows. Class 5 cars should have a reduction coefficient of 0.5. Current rates should remain unchanged for class 4 cars (coefficient 1.0), for class 3 increase it 1.5 times, for class 2 and below – 3 times.

Utilization fee should also be differentiated according to environmental classes of cars and engine power. The idea is to transform the utilization fee into the excise tax on disposal of the car, i.e., to make the utilization fee a tax. It is proposed to make the excise tax on disposal equal to excise tax on the sale of the car of 4 and 3 classes, and the 5th class should use a reduction coefficient of 0.5.

With the introduction of environmental standards of 6 class in 2016, rates for all of transport taxes should be adjusted accordingly, i.e. it should be encouraged to purchase vehicles of 6 class.

The main problem is payments for negative impact on the environment. They are extremely important for the environment, as they aim to compensate for the damage caused by the negative impact on the environment. However, it turns out that those payments in Russia are made only by legal entities. Simple car owners (individuals) are not able to calculate these payments. In our opinion, these payments for the emissions in the atmosphere need to be transformed into an environmental tax. This tax may be installed in the form of additional increase to the price of fuel.

In this case, all car owners will compensate for the damage to the environment. It is also possible to establish a direct link between the consumption of fuel and environmental pollution. However, the following idea should be considered: calculating of the environmental tax as an addition to the price of fuel in order not to mix this tax with excise taxes on fuel. To promote environmental awareness of consumers it is advisable that the environmental tax and the excise tax on fuel are separated in checks at gas stations.

Table 5 shows the changes in the rates of specific payments for the use of motor vehicles considering the implementation of the proposed changes.

Table 5: Existing and suggested rates of specific payments for using the vehicle based on the vehicle capacity (100 horsepower), the dollar exchange rate is for July 2014.

Ecological class of a car	Excise taxes on the sale of a vehicle		Transport tax		Utilization fee	
	Current rate	Suggested rate	Current rate	Suggested rate	Current rate	Suggested rate
5	102	102	100	50	60	51
4	102	510	100	100	90	510
3	102	1020	100	150	600	1020
2			100	300		

Suggested changes will reduce the tax burden on the owners of class 5 cars and will increase the tax burden on owners of class 4 cars and below.



6 Analysis of the expected effects of the ecologization of transport taxes

The differentiation of transport taxes on environmental classes of produced and used vehicles is expected to have positive effects:

- 1) forced transition of the Russian automotive industry to the production of motor vehicles of 5 and, later, 6 environmental class. The introduction of the excise tax on the sale of trucks and buses will drive these re-productions;
- 2) forced car fleet renewal in Russia. High transport tax for old and polluting vehicles will encourage consumers to stop using them and purchase new vehicles;
- 3) forced development of the road network in the Russian regions by increasing transportation taxes and establishing their intended use through a road funds system. The increase in income from these taxes to the consolidated budget is expected, according to our calculations, to be almost 1.7 times (Table 6).

Table 6: Comparative evaluation of changes in income in the consolidated budget of Russia before and after the implementation of the proposed changes (the calculations are made based on the production and use of motor vehicles in 2012), in billions of dollars.

Payment	Fact	Prognosis	Increase, %
Excise taxes on the sale of cars and motorcycles*	0.950	1.575	166
Excise taxes on fuel	10.412	10.412	100
Transportation tax	2.597	6.082	234
Fee for a negative impact on the environment	0.839	0.839	100
Utilization fee	0.539	1.414	262
Total	15.337	20.322	132

Note * – excluding trucks.

In general, the process of ecologization of a group of transport taxes is expected to significantly strengthen the fiscal effect of these taxes due to the need for a significant increase in revenues of regional road funds for the development of the transport network in the region.

Differentiation of transport taxes on environmental classes can also have possible negative effects:

- 1) Higher prices for new Russian cars of 3 and 4 classes – the most available cars in the cheapest price segment. As a consequence – the reorientation of demand to the cars of 5th class, produced by foreign companies in the mid-price segment.
- 2) Reducing the availability of class 5 vehicles for the poor.
- 3) Increase in the tax burden for owners of older vehicles may not always lead to the decision to replace them due to the lack of funds.

Increase of the fiscal effect by 1.3 times will be differently distributed by different manufacturers. Most fiscal burden will fall on the automakers Lada and KAMAZ. They still have not solved the problems of the transition to the production of class 5 cars. Fiscal burden on foreign manufacturers that assemble their cars in Russia will be virtually unchanged. They do not have the significant issues the Russian manufacturers have.

Fiscal burden will be differently distributed between owners of different vehicles. Owners of cars of 5 environmental class will experience a twofold decrease in the tax burden, while the owners of old cars of 2 and 1 environmental class will experience a significant increase in transportation tax (up to 3 times). Owners of class 3 cars will also experience tax increase, but not as significant (up to 1.5 times). In general, the increase in the fiscal burden will affect 70% of car owners. This is the prevailing share of car owners. Protesting mood among car owners is possible in the future.

To reduce the risk of negative effects, ecologization of transport taxes should be implemented in stages. Transport tax can be reformed next year. It's better to introduce excise taxes on the sale of vehicles a year after that, to give the domestic automobile industry an opportunity to make the transition to the production of cars of higher environmental classes.

7 Conclusions and research prospects

Currently, the road network in Russia does not meet modern requirements. Road construction in the regions is carried out very slowly.

Russia has a poor age and ecological structure of its car fleet. The pace of fleet renewal is unsatisfactory. Domestic production is still concentrated on the production of cars of low environmental classes.

In this paper we have proved that the current Russian system of transport taxation performs unsatisfactorily in the development of the road network and ecologization of the environment. Existing transport taxes do not stimulate the Russian automotive industry to improve environmental class of produced vehicles. Existing transport taxes do not encourage car owners to renew the fleet.

The prospects of the connection of a number of transport taxes to environmental class of a car are shown. Our suggestions on ecologization of transport taxes in Russia will lead to a number of significant positive effects. Negative effects can also possibly occur.

Further studies may be associated with the development of mechanisms for the reconfiguration of transport taxes with the introduction of new environmental class standards. It's also a promising prospect to develop a model of environmental tax that would be paid by all users of vehicles. This tax should replace the existing payments for negative impact on the environment in Russia.

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