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Interpreting the Change of the Age and Experience Coefficient in Motor Third-Party Liability Insurance

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ABSTRACT

The article highlights the influence of the equity factor in the insurance industry on the example of the age and driving experience coefficient development in the motor third-party liability insurance (MTPL). The **aim** of the research is to study risk level variation in the car insurance industry depending on the age and experience of a driver. The authors consider the Automated Information System (AIS) data of MTPL as a **methodological basis** of the article. The results show that the risk level depends on each of the parameters, in particular, risk levels for older drivers are lower by comparison with younger drivers with the same level of driving experience. On this basis, the authors design a two-dimensional table to assess risk levels where the risk level between separate cells differ in five times. The study presents and analyses the actuarial calculations which served as a foundation for the MTPL policy change in 2018*. The article provides recommendations on improving MTPL tariffing within the modern model framework and motor tariff liberalization. The study allowed the authors to verify theoretical assumptions and find direct mathematical relations between the age and experience coefficient and its constituent data. The authors **concluded** that it is reasonable to introduce additional categories of drivers taking into consideration demographic changes and retirement age increase. The **results** of the research may improve MTPL affordability and have practical utility for motor insurers in transition to individual tariffs. They also can help to address discussions and approaches to estimate a coefficient of age and experience (CAE) set by Article 9 of the Federal law of 25.04.2002 No. 40-FZ "About obligatory insurance of civil liability of owners of vehicles".

Keywords: insurance; MTPL; rate; correction factor; actuarial calculation; GLM-model; coefficient; age; driving experience level; gender

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* Bank of Russia Ordinance No. 5000-U, of December 4, 2018, "On limits for the basic rates of insurance tariffs (their minimum and maximum values in rubles), coefficient of insurance rates, insurance rates structure requirements, and the procedure for their application by insurers in calculating insurance premiums of MTPL" (registered with the Ministry of Justice of Russia on December 29, 2018 No. 53241).

INTRODUCTION

A lack of financial literacy, a wary attitude of potential customer to insurance companies, and low insurance service affordability hinders the development of insurance relations in Russia. Leading Russian insurance researchers discussed this back in the 1990s and 2000s, professors E.V. Kolomin [1], R.T. Yuldashev [2], V.B. Gomellya [3, 4].

Fair pricing, insurance tariffs adequacy, as well as understanding the rights and financial liabilities under the insurance policy ensure a successful deal between the insurer and insured. The issues of the positive impact of a fair decision on the development of a choice strategy were considered by economists at the beginning of the 20th century [5, 6].

Regular discussions on how to calculate insurance premium for common insurance types ensure the development of insurance relations.

The company's insurance service assessment in Russia depends largely on the MTPL, as the most common type of insurance. The surveys conducted by the research group of the Financial University under the supervision of Professor A.N. Zubets[1] [7], indicate that in recent years insurance has been viewed as an economically justified solution to manage hazards and ensure a feeling of comfort and confidence (*Fig. 1*).

At the same time, the number of respondents considering insurance a waste of money is steadily decreasing. National Agency of Financial Research (NAFI) survey demonstrated similar results where at least 63% of respondents generally had a positive attitude towards insurance in 2019[2].

Since 2003 compulsory MTPL in Russia has undergone several changes and is viewed much more positively now.

The Russian Popular Front (ONF) monitoring survey conducted in 2019 revealed respondents' positive expectations of compulsory MTPL reform. This will undoubtedly have an impact on the general perception of insurance services[3], including the implementation of the home emergency cover policy which is of social importance.

Widely accepted MTPL rate calculation and recognized benefits of the insurance market ensure Russian insurance industry growth. It is of crucial importance to provide an actuarial reliable calculation of tariffs and use all the available tools to guarantee fair pricing of MTPL cover.

Although fair pricing is of great concern to consumers, it is hardly addressed by the Russian economists. In particular, it is of special concern to senior vehicle owners with regards to MPTL tariff calculation based on the age and driving experience coefficient.

MTPL TARIFF CALCULATION METHOD

Insurance science describes development and methods of motor insurance in detail, which is due to its wide spread and popularity of insurance products, as well as its implementation history. Casco and MTPL insurance are characterized by high loss and claim history ratio, which encourages the development and implementation of loss reduction methods for these insurance types. Thus, the generally accepted bonus-malus system [8] depends on the accident history and the use of franchises.

Many of the generally accepted car owners' liabilities and Casco risk factors of Russia are included in the MTPL tariff calculation formula, but not all. This fact does not suggest effective approaches to the individual premium calculation.

$$T = TB \times C, \quad (1)$$

T — tariff; TB — tariff base (minimum and maximum value defined by the Bank of Russia); C — corrective coefficient.

[1] URL: https://www.consult-cct.ru/fakti/19573.html (accessed on 01.05.2020).

[2] URL: https://tass.ru/ekonomika/6743291 (accessed on 01.05.2020).

[3] URL: https://onf.ru/2019/11/06/eksperty-onf-nastaivayut-na-otmene-territorialnogo-koefficienta-i-uvelichenii-vyplat-po/ (accessed on 01.05.2020).

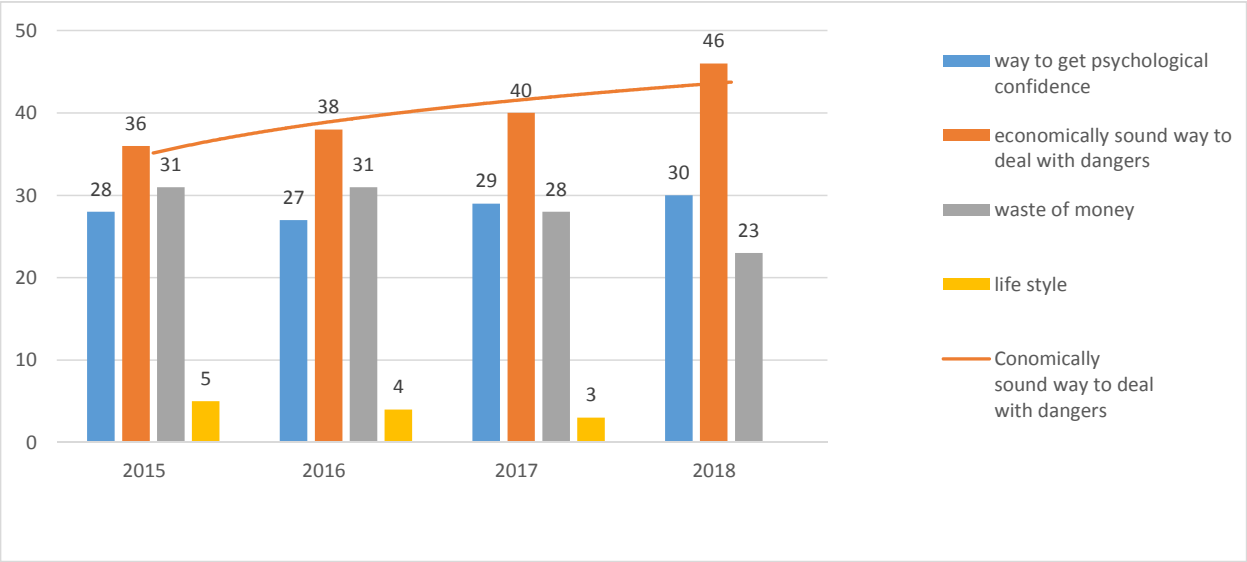

Fig. 1. **Distribution of answers to the question: "What is the meaning of insurance?", % of all respondents**

Source: Report on fundamental research work "Formation of the concept and development of the theory of insurance in modern society", the state task of the Financial University for 2019.

$$C = CT \times CBM \times CAE \times CL \times \times CP \times CS \times CIP \times CV, \quad (2)$$

CT — territorial coefficient; CBM — bonus-malus; CAE — age and driving experience coefficient; CL — "multiple drivers" limit; CP — power coefficient; CS — coefficient of the period and purpose of using a special vehicle (snow-clearing, agricultural, watering, etc.); CIP — insurance period; CV — applies for gross violations of MTPL policy.

These coefficients do not fully detail specific features of vehicles. For example, the use of a vehicle as a taxi is not always registered and considered, the car-sharing statistics are only being collected. Although, there is evidence that driving style changes significantly when driving your own car and a shared car[4].

Corrective coefficient of CAE defines driver's age and driving experience, however does not consider the actual practical driving experience. There are situations when the non-practical driving experience is over 20 years, but a driver has been using a driving license only as an additional identification document.

$$CAE = f(A, E), \quad (3)$$

где A — age of the driver; E — driving experience.

Currently, electronic devices are used to collect information about the insured's driving style, place, and time of the use of vehicles. A significant amount of data has been gathered about the impact of the place of residence, building floor, garage in possession, gender, age, driving experience, the profession of the insured, the brand of the car and its age. Although, these data have not been reflected on the insurance rates (1–3).

In many countries, including Russia, there is a significant gap in Casco tariffs for various car models with comparable engine power, but MTPL calculation in Russia is only based on the engine power, age, driving experience of the driver, and the territory of residence.

For example, the full Casco tariff for Volvo cars will be lower than for Subaru and significantly lower than for Lexus[5], which is justified by accident and theft history of these models,

[4] Morzharetto I. Chariot of common use. Profile. 2020;4(115):38–41.

[5] See, for example, URL: https://www.sravni.ru/kasko/ (accessed on 01.05.2020).

as well as owner's behavior. It is reasonably believed that the owners of relatively expensive and insured cars demonstrate prudent behavior on the road, other car owners also prefer not to take risks with these vehicles, which is immediately evident when analyzing the data of road accidents. There are also opposite examples reflecting the influence of consumer behavior on the driving style, perception of a car and accident history, leading to different insurance tariffs.

Not all risk factors are considered in tariffing, which may be due to legislative and ethical restrictions. For example, in Russia there is a clear connection between the presence of infants and young children in the car and a change in the driving style of a young mother: according to the rules, the child should be in the back seat, but a mother driver will turn around on the child's actions and may not notice road hazards in time. According to most insurers, a change of a road behavior leads to a significant increase in the number of small accidents. However, this circumstance rarely leads to a tariff increase, as it is perceived negatively by consumers, and insurance companies tend to maintain consumer loyalty.

Tariffs for Russian MTPL are based on the bonus-malus system, which, due to the limited impact on tariffs, does not keep up with them. It is important to note that the parameters related to the brand of a car, total driving experience, and gender of a driver are not considered when calculating MPTL rates, due to the unified approach. These parameters affect the tariff in a non-linear way. For example, a taxi driver will have a considerable driving experience, but this will not have a positive impact on the accident history. The same parameters are accounted for when calculating Casco tariffs, which allow to reduce loss ratio and increase the efficiency of the insurance contract.

A fair MTPL tariff calculation based on the system of correction factors for the base tariff established by Russian legislation will be limited due to the incompleteness of risk factors, while the use of a simplified age-driving experience model does not allow achieving the required accuracy.

Accordingly, the CAE coefficient should effectively consider the insured's consumer behavior [coefficient CCB, formulas (4–6)].

$$\text{CAE} \rightarrow \text{CCB} \tag{4}$$

$$\text{CIP} = f(\text{A}, \text{E}, \text{E1}, \text{Gender}), \tag{5}$$

where E1 — actual driving experience, calculated by the total period of MTPL insurance and/or data provided by insurance companies; Gender — driver's gender.

The CP coefficient should consider the consumer behavior of a driver and be statistically reasonable. Currently, statistical data have been collected to predict the driving style of the vehicle owner, depending on the brand of the car, colour of the car, etc.

$$\text{CP} \rightarrow \text{CPB}, \tag{6}$$

where CPB — power and brand coefficient.

The introduction of additional correction factors will require significant actuarial calculations and complicate the process of MTPL tariffs change. It is easier and more efficient to implement changes at the micro-level of insurance companies based on the liberalization of the insurance tariff, rather than at the federal level.

In addition, the accumulated statistics allow considering age and driving experience data more effectively even using the current calculation strategy.

OUTLINING THE PROBLEM

The aim of the study is to identify changes in the level of risk for MTPL policy, depending on the age and driving experience of a driver.

We used the following sources for analysis: AIS MTPL database on MTPL insurance policy and losses for the period from 01.01.2014 to 06.30.2018, open data of the Bank of Russia, the All-Russian Union of Insurers and the

Russian Association of Motor Insurers data [9], market studies of the authors [10–12], motor fleet data [13] and regional development problem statistics [14, 15].

Before the start of the research, the data was cleared from the MTPL insurance policies with "multiple drivers", as well as policies where the vehicles belonged to legal entities. As a result, data with a combined exposure of 100.2 million policy-years, containing information on the drivers' age and experience, were available for the study.

At the first stage of the research, the contracts and data on payments, which were brought to final size, considering the estimates of insurance reserves, were grouped by drivers' age with increments of 1 year. The authors used a general linear model (GLM) when calculating actuarial data and explained it [16–21], as well as the works of Russian and foreign actuaries applicable in motor insurance [22–24][6].

GLM is the main model used worldwide for several decades for tariffing in motor insurance industry. In addition, in recent years, approaches to tariffing based on machine learning methods, which are aimed at working with large amounts of statistical information, have become more widespread. However, despite the machine learning methods, GLM models are still very popular, since they are distinguished by the transparency of the process in obtaining results, extensive practical application, and the presence of many products that implement GLM algorithms.

GLM is a multiple regression model that allows finding the correlation between the dependent variable (number of insured events, average loss) and predictors (pricing factors). In tariffs, as a rule, separate models are used for the average loss and the frequency of the insured event. In addition, to estimate the average loss, the Gamma distribution is used; to estimate the frequency, the Poisson distribution is used.

The correlation between the insurance premiums and exposure in the group allows assessing the real level of risk in each age group (in fact, the net rate). To increase the clarity of data display and by the purpose of this study, the concept of "risk level" was additionally introduced, i.e. the obtained values were normalized, where the value of the predicted net tariff in the youngest age group was taken as the unit. The results are presented in *Fig. 2*.

Fig. 2 and the calculations demonstrate that a decreasing risk level can be traced depending on the age of the driver. The ratio of the risk level in the youngest group and the most reliable (63 years) differs by 5.9 times, which needs to be reflected on the age–driving experience coefficient (CAE) of the tariff reform.

The results analysis shows the presence of an "outburst" at a point of age 21 years. According to most experts, this is due to the return of a significant part of men of military age from the army and them obtaining a driving license.

For further practical application, it is worth highlighting the section of the curve of 18–30 years, where there is a rapid change (decrease in acceleration) of the risk level, and the segment of 47–57 years, where the change of the acceleration and trend vector occurs (in fact, the straight section of the first derivative, where the second derivative changes to the one with the opposite meaning).

The dependence of the risk level on age can be represented in the formula (7) with a high degree of reliability $R^2 = 0.9969$:

$$RL_{age} = 0.0000005431*A^4 - 0.0001135196*A^3 + 0.0088109900*A^2 - 0.3055612998*A + 4.2827146015, \quad (7)$$

where RL_{age} — risk level depending on the age of a driver; A — the age of a driver.

The authors tried to find explicit inflection points of the risk level function depending on age RL_{age}, where a sharp change of risk level

[6] Risk Classification and Health Insurance. CIRRELT. 2011–67. p. 55. URL: https://www. cirrelt.ca/DocumentsTravail/CIRRELT-2011–67.pdf.

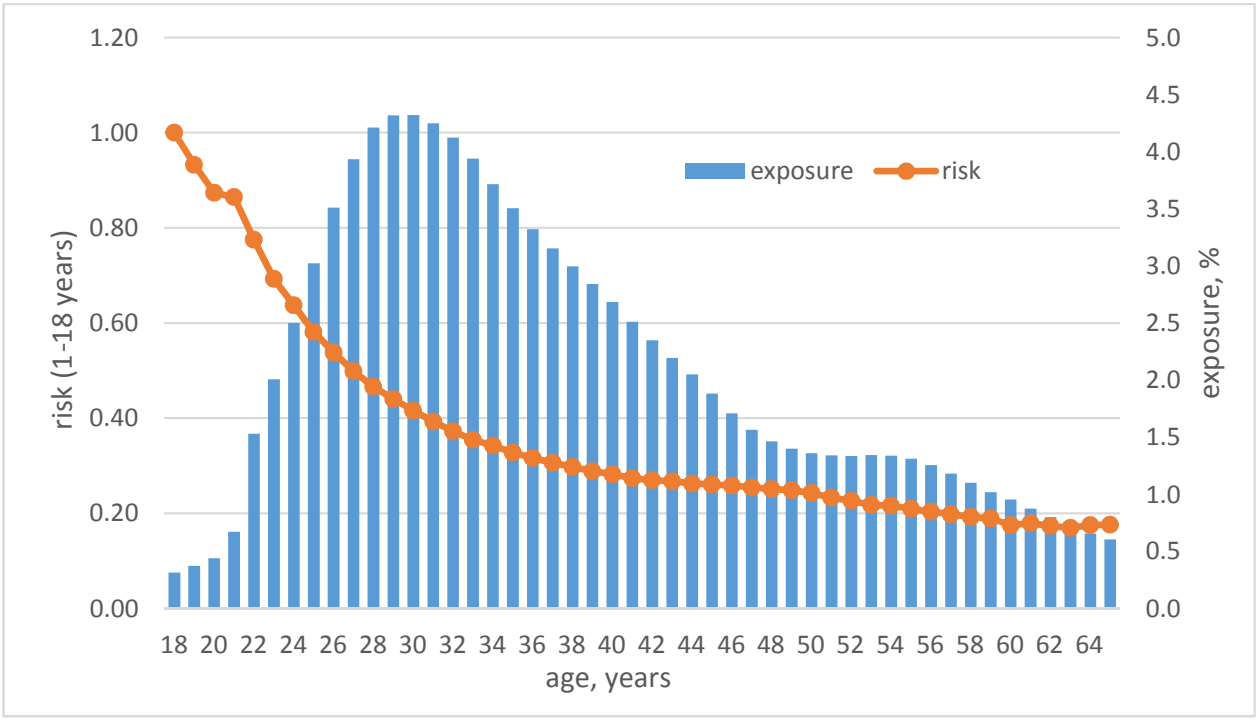

Fig. 2. **The conditional dependence of the driver's risk level on age**

Source: AIS MTPL data and authors' calculations.

with age could be expected. However, the differentiation of this equation did not allow them to be identified — the risk reduction rate gradually decreases to the age of 46 years, and a complete change in trends occurs at the point of 50 years (the 2nd derivative crosses the abscissa axis). A graphical representation of the derivatives of function (7) is presented in *Fig. 3*.

A similar calculation may be applied to the driving experience data. Available data allow analyzing the results in the range of driving experience 0–47 years. In this case, the risk level of the most inexperienced drivers (0 years of experience) and the most reliable group (44 years of experience) has an even greater gap — 6.3 times. The results are presented in *Fig. 4*.

The dependence of the risk level on the driving experience of a driver can be represented in the formula (8) with a high degree of reliability $R^2 = 0.9959$:

$$RL_{experience} = 0.0000009153*S^4 - 0.0001091855*S^3 + 0.0046575579*S^2 - 0.0899548092*S + 0.9829409818, \quad (8)$$

where $RL_{experience}$ — risk level depending on the driving experience; S — driving experience.

It should be noted that citizens over 18 years old with no age limit and of 16 years old under certain restrictions are allowed to obtain a driving license in Russia.

A noticeable deviation from the trend is seen at the point "3 years" of driving experience. Interviewed experts associate this outburst with the return of drivers from the army who had managed to get a driving license before being called up for the military service (2–3 years of non-practical driving experience), but did not have any actual driving experience. This outburst correlates with a similar deviation in the age category of 20 years, as shown in *Fig. 2*. This category also includes drivers who first obtain a driving license and only after some time (2–3 years later) get a vehicle. Such drivers may

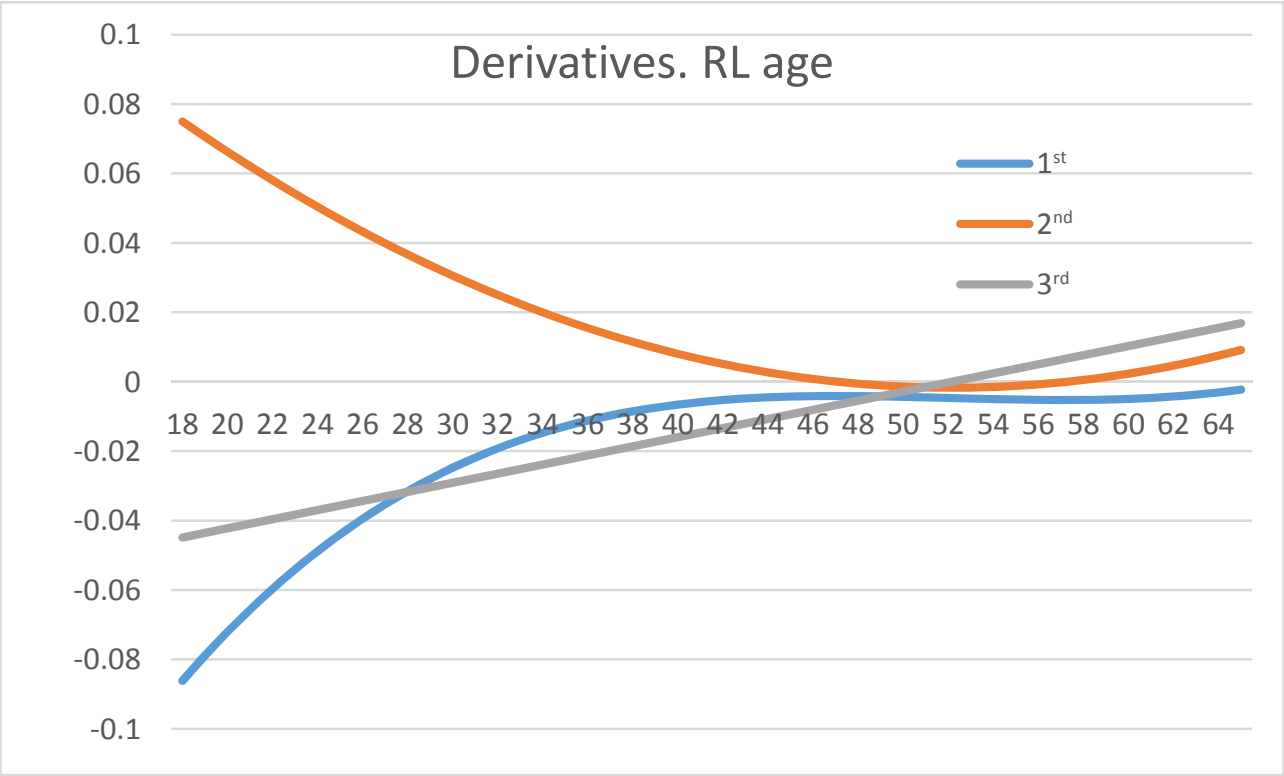

Fig. 3. **The first derivative of the RL age function**

Source: AIS MTPL data and authors' calculations.

Note: to increase visualization the values of the second derivative are scaled up by 10 times, the third derivative by 100 times.

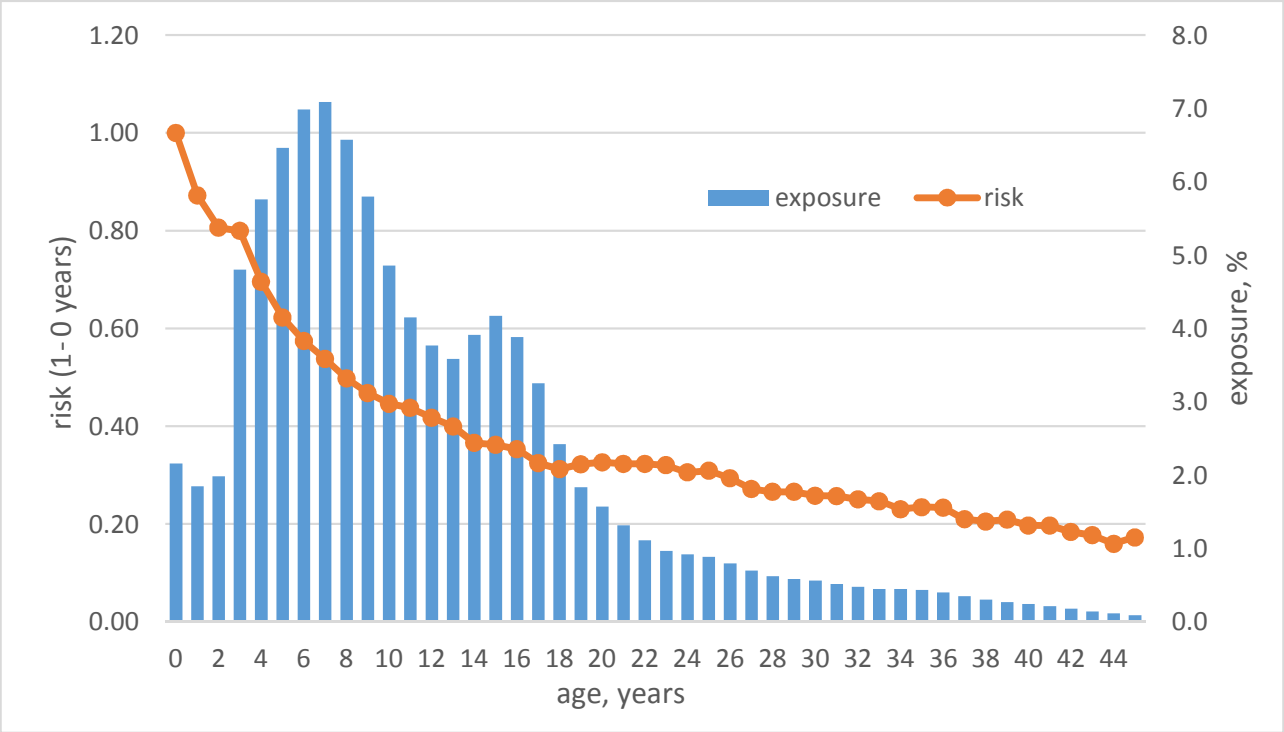

Fig. 4. **The conditional dependence of the driver's risk level on his experience**

Source: AIS MTPL data and authors' calculations.

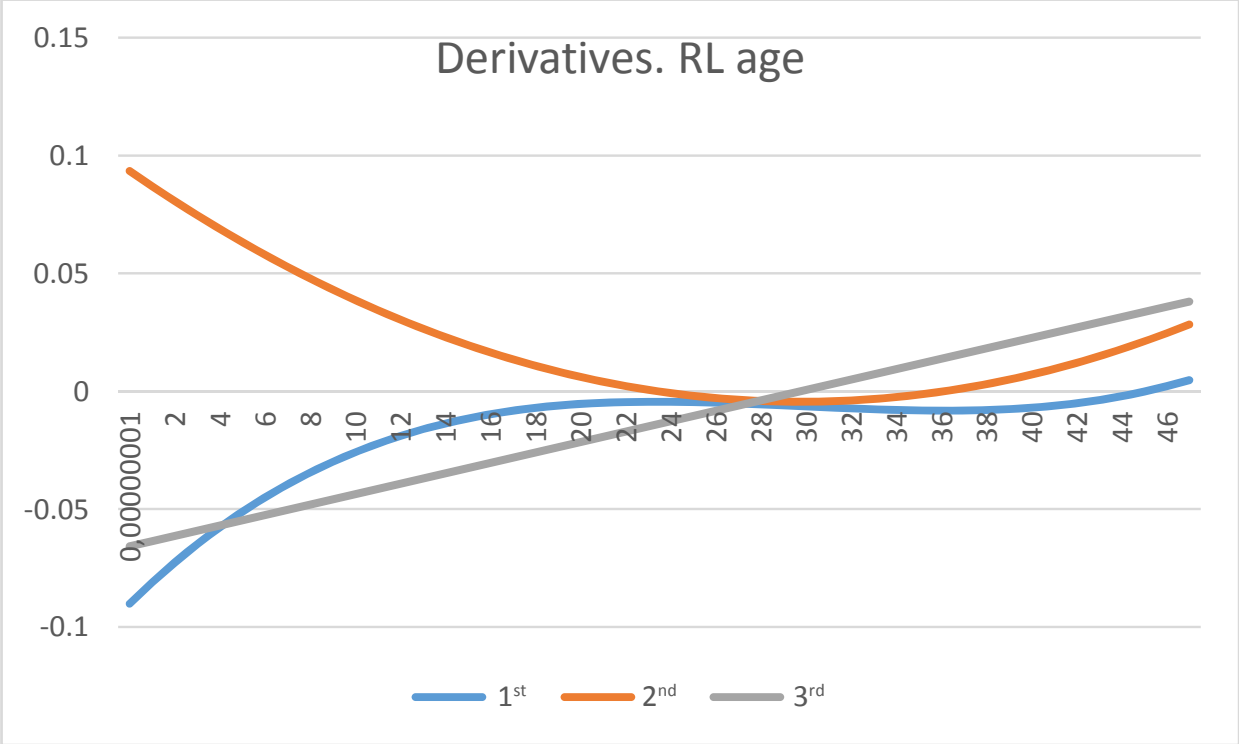

Fig. 5. **The conditional dependence of the driver's risk level on his experience**

Source: AIS MTPL data and authors' calculations.

Note: to improve visualization the first derivative has been scaled up by 10 times, and the third by 100 times.

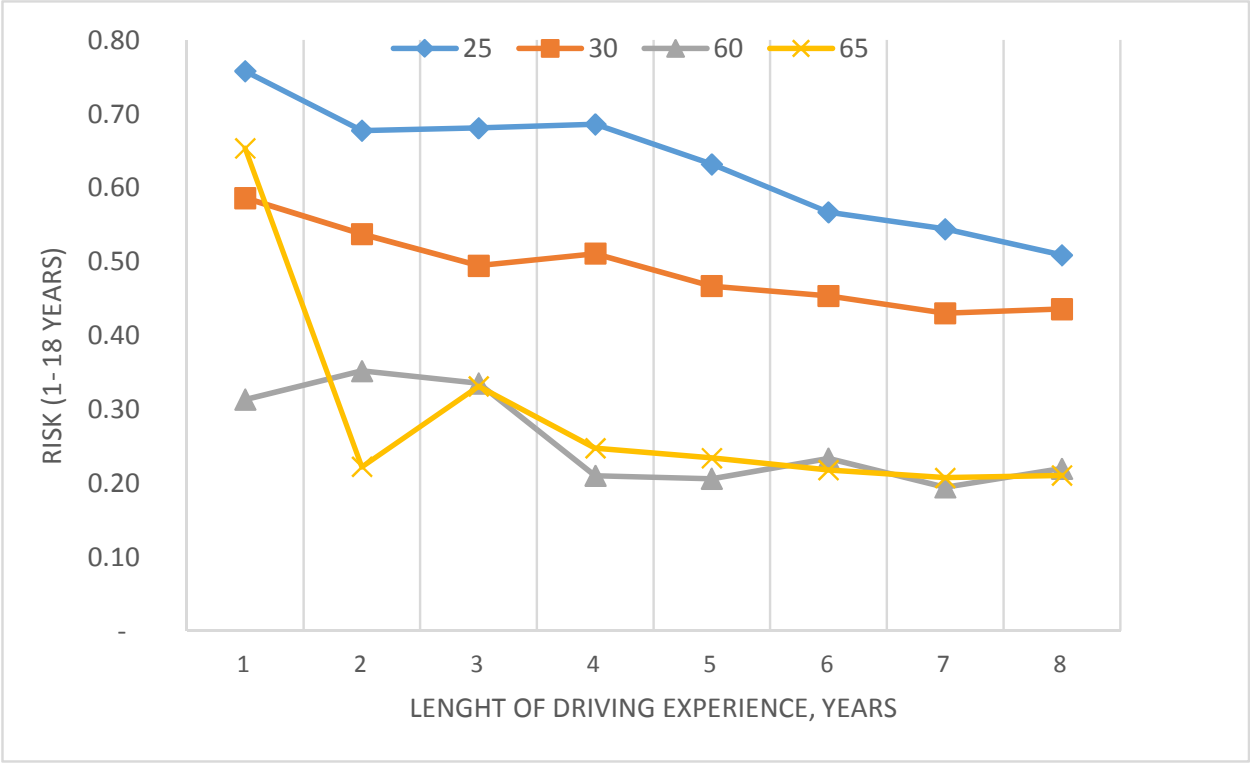

Fig. 6. **Dependence of the risk level on the driving experience for certain age groups**

Source: AIS MTPL data and authors' calculations.

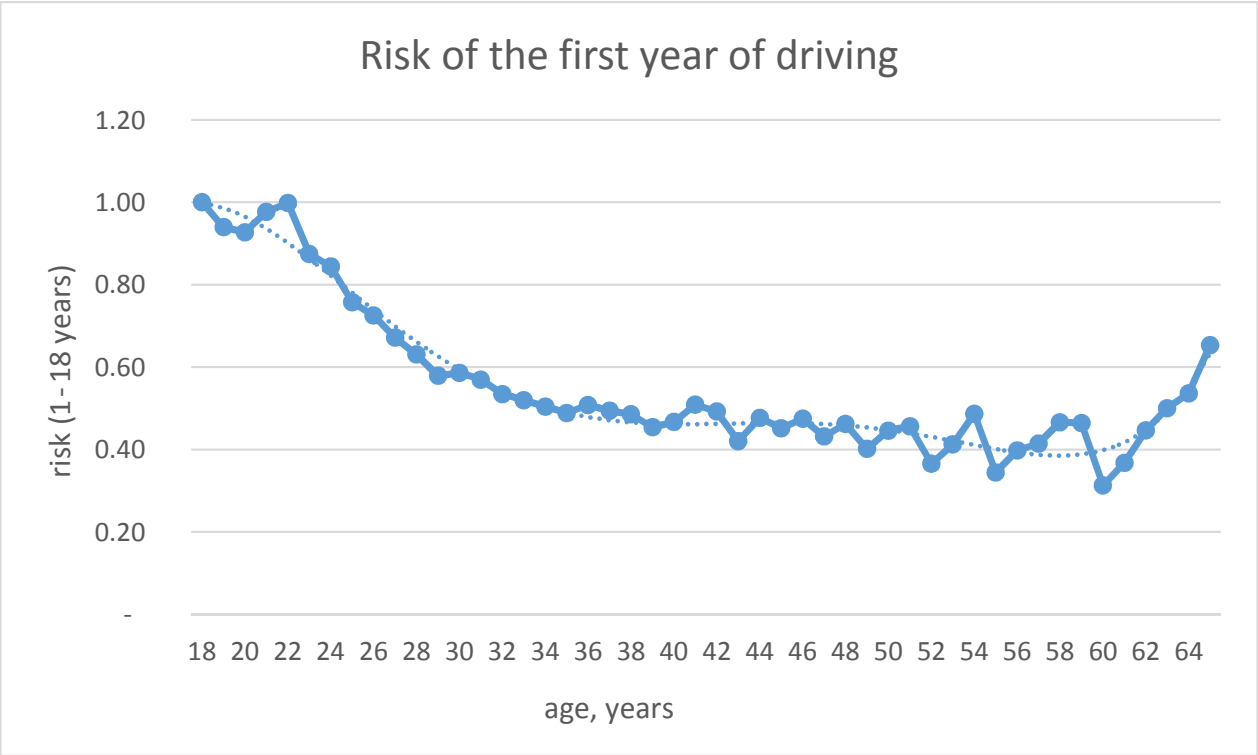

Fig. 7. **Dependence of the risk level in the first year of driving on the age of the driver**

Source: AIS MTPL data and authors' calculations.

have non-practical two-three-year driving experience, but the lack of practical driving experience shows a high level of risk.

The authors attempted to search for several key factors of the risk level function depending on the driving experience $RL_{experience}$, where a sharp change in the risk level depending on the driving experience would be expected. However, the differentiation of this equation also did not allow us to identify obvious factors for developing solutions — the risk level is gradually decreasing. We can distinguish segments with an approximately equal rate of change of the risk level: 0–1–2 years, 3–4 and 5–6, years, then the rate of change of the risk level decreases and becomes insignificant after 14 years of driving experience. A graphical representation of the derivatives of function (8) is shown in *Fig. 5*.

The obtained data allowed us to proceed with a two-factor analysis of the dependence of the risk level on the age and driving experience. *Fig. 6* shows the dependencies of the risk level $RL_{experience}$ for the first seven years of driving experience for several age groups. It can be seen from the graph that the risk level of young drivers is significantly higher than the risk level of senior drivers with similar driving experience.

The authors noticed a sharp curve in the "after 63 years" segment. In this area of the graph, there is an obvious increase of risk for inexperienced drivers (driving experience 0 years). But this effect completely disappears after the first year of driving (the risk level decreases immediately by half), while for young drivers there is no such sharp decrease of the risk level, but a gradual decrease of the risk level.

The dependence of the risk level on the driver's age should be emphasized separately, for example, in the first year of driving the risk level of young new drivers is about two times higher than the risk level of forty-year-old new drivers. Graphical data are presented in *Fig. 7*.

RESEARCH RESULTS

Thus, there are mathematical prerequisites for building a two-dimensional risk assessment model for the age-driving experience parameter. *Fig. 8*. represents the graphical data.

The results can be used to implements a reform of the age-driving experience coefficient calculation. It should be noted that the MTPL tariff system considered the use of large aggregations by age from 2003 until 2019 (*Table 1*).

Age–driving experience groups presented in *Table 1* are very heterogeneous in terms of risk, as it was mentioned in the previous analysis.

In 2019, the Bank of Russia has carried out a reform of the age-driving experience coefficient calculation system. As a result, the number of age-driving experience groups has increased to 58. The current coefficient values are established by the Bank of Russia Ordinance No. 5000-U, of December 4, 2018, "On limits for the basic rates of insurance tariffs (their minimum and maximum values in rubles), coefficient of insurance rates, insurance rates structure requirements, and the procedure for their application by insurers in calculating insurance premiums of MTPL", and are presented in *Table 2*.

The increase in the number of separately tariffed groups is a step aimed at clarifying the tariff system of compulsory MTPL. However, a comparative analysis of the data in *Table 1* and *Table 2* shows that the coefficient values have changed insignificantly. For example, the majority of drivers had a coefficient equal to one before 2019, after the reform of 2019, the coefficient decreased only to 0.96, and for the youngest and most inexperienced drivers, the coefficient increased from 1.80 to 1.87. Such a change of the driving experience coefficient does not allow us to fully consider the risk level for the selected groups. It is demonstrated in *Table 3* which provides the coefficient estimation based on the accumulated data of the actual loss ratio.

The results may be compared with the current tariff system, as presented in *Table. 4*. To

Table 1

The system for calculating the coefficient of age and experience until 2019

Experience, years / Age, years	0–3	More than 3 years
16–22	1.8	1.7
23 –	1.6	1.0

Source: authors' calculations according to the law of MTPL*.

* Federal Law of April 25, 2002 No. 40-FZ (as amended on December 2, 2019) "On Compulsory Motor Third Party Liability Insurance" (with no amendments and supplements, came into force on 01/01/2020).

increase visibility green areas indicate sectors where the CAE may be reduced, and red areas where the CAE should be increased.

Visually, there are several areas: the age category of 22–24 years, where the current coefficients need to be increased by 1.4–1.9 times; and the age categories older than 40 years, where the current coefficients may be reduced by 15–35%. Drivers with a driving experience of 3–6 years are also clearly distinguished and overly confident in their skills. Accordingly, it is reasonable to focus on strategies aimed at reducing road accidents.

The proposed approach to risk segmentation in calculating the age–driving experience coefficient cannot be considered without the CL coefficient (correction factor referring to multiple drivers listed on the same car insurance policy).

On average for the period 2014–2018 half of the share of "multiple drivers" insurance policy was 11.7%, and the average value of CAE + CL was 1.13. When switching to a different tariff calculation system for the CAE coefficient, it will be necessary to refer the value for the CL coefficient to a higher (or at least the same) risk factor in the CAE risk group. In this case, there will be no disputes if high-risk

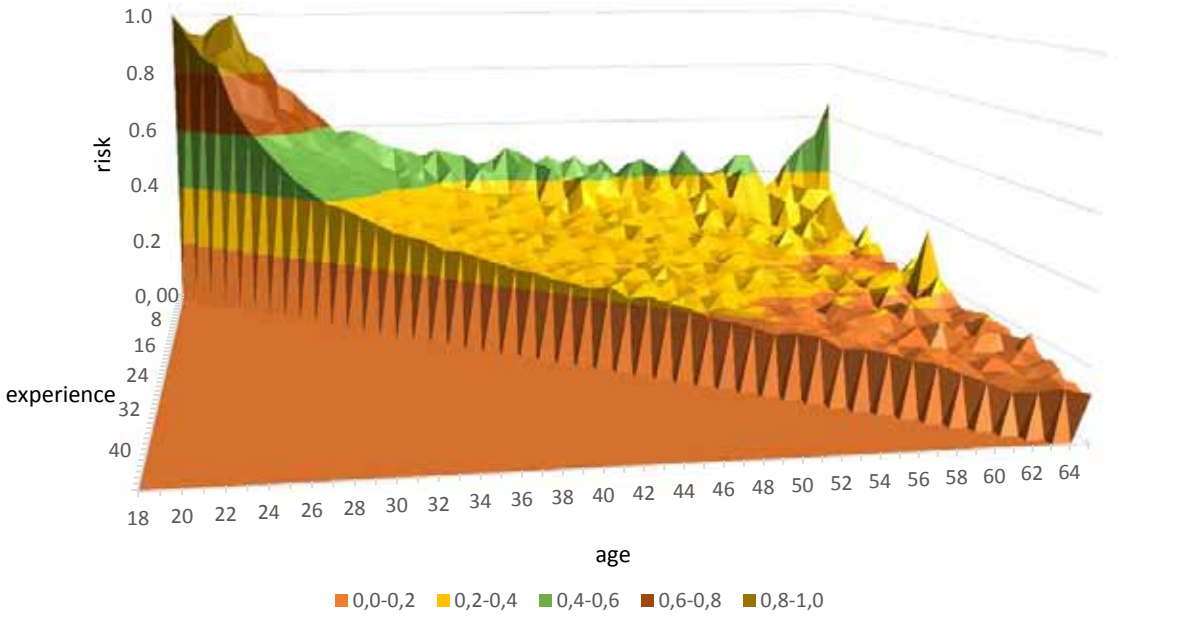

Fig. 8. **Dependence of the risk level on the age and experience of the driver**

Source: AIS MTPL data and authors' calculations.

Table 2

The current system for calculating the age and experience coefficient

Experience, years / Age, years	0	1	2	3–4	5–6	7–9	10–14	More than 14
16–21	1.87	1.87	1.87	1.66	1.66			
22–24	1.77	1.77	1.77	1.04	1.04	1.04		
25–29	1.77	1.69	1.63	1.04	1.04	1.04	1.04	
30–34	1.63	1.63	1.63	1.04	1.04	1.01	0.96	0.96
35–39	1.63	1.63	1.63	0.99	0.96	0.96	0.96	0.96
40–49	1.63	1.63	1.63	0.96	0.96	0.96	0.96	0.96
50–59	1.63	1.63	1.63	0.96	0.96	0.96	0.96	0.96
Older than 59	1.60	1.60	1.60	0.93	0.93	0.93	0.93	0.93

Source: authors' calculations according to the law of MTPL*.

* Federal Law of April 25, 2002 No. 40-FZ (as amended on December 2, 2019) "On Compulsory Motor Third Party Liability Insurance" (as amended and supplemented, came into force on 01.01.2020).

Table 3

Risk level calculation results depending on the age and experience

Experience, years / Age, years	0	1	2	3–4	5–6	7–9	10–14	More than 14
16–21	2.45	2.45	2.49	2.34	2.34			
22–24	2.45	2.45	2.36	2.05	1.59	1.45		
25–29	2.41	2.07	1.85	1.75	1.47	1.26	1.03	
30–34	1.90	1.61	1.48	1.43	1.23	1.10	0.95	0.87
35–39	1.84	1.45	1.39	1.25	1.11	0.96	0.89	0.80
40–49	1.71	1.43	1.33	1.17	1.01	0.90	0.82	0.72
50–59	1.62	1.41	1.22	1.13	1.01	0.82	0.82	0.64
Older than 59	1.55	1.41	1.22	1.06	1.01	0.75	0.75	0.61

Source: AIS MTPL data and authors' calculations.

Table 4

Assessment of deviations of the actual risk level depending on the age and experience based on the current MTPL rating system (%% of the current system)

Experience, years / Age, years	0	1	2	3–4	5–6	7–9	10–14	More than 14
16–21	31	31	33	41	41			
22–24	38	38	33	97	53	40		
25–29	36	22	13	68	41	21	–1	
30–34	16	–1	–9	37	18	9	–1	–9
35–39	13	–11	–14	26	16	0	–8	–16
40–49	5	–12	–18	22	5	–6	–15	–25
50–59	–1	–13	–25	18	5	–15	–15	–34
Older than 59	–3	–12	–24	14	8	–19	–19	–34

Source: AIS MTPL data and authors' calculations.

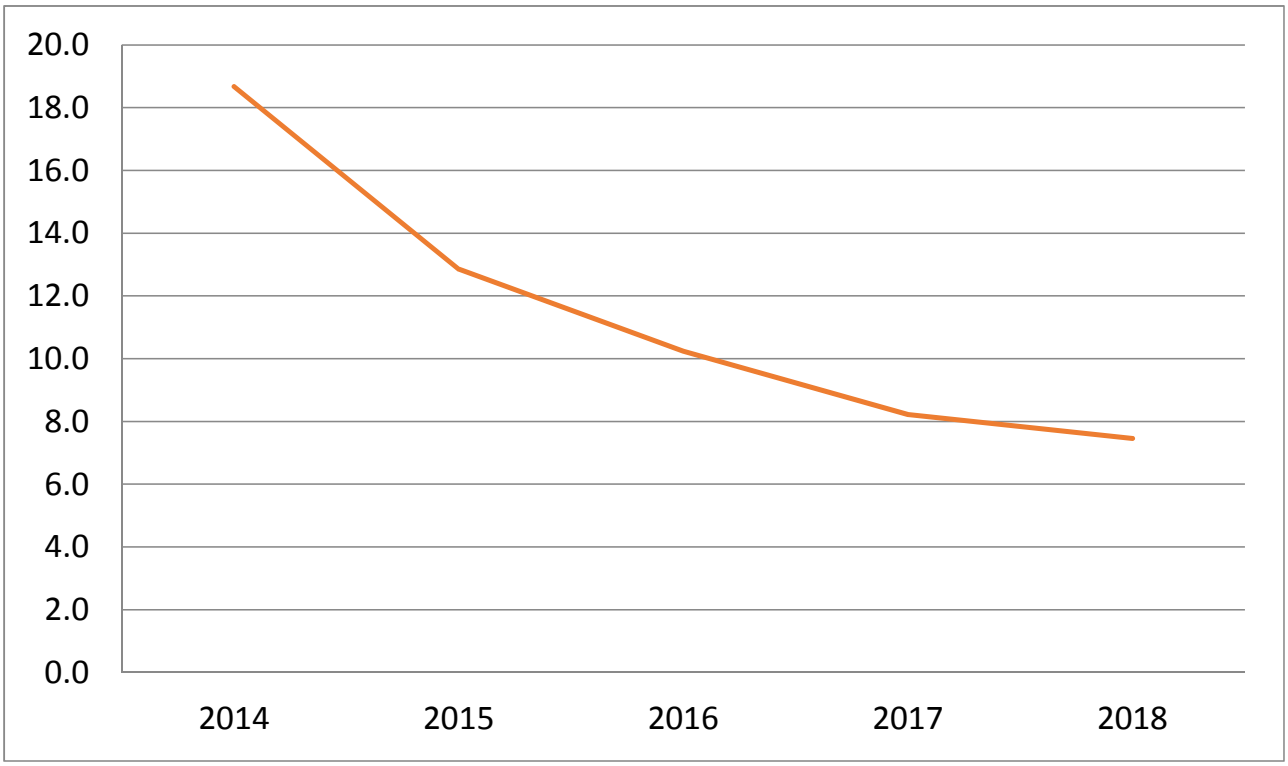

Fig. 9. **The share of "without limitation" insurance certificate holders to the total number of drivers**

Source: AIS MTPL data and authors' calculations.

drivers opt for the "multiple drivers" insurance. In addition, it is necessary to preserve the integral total value of the CL and CAE coefficients.

At the same time, a clear distinction of drivers by risk level and the high (conditionally blocking) value of the CL coefficient is likely to imply the migration of drivers towards insurance policies based on individual terms (without a tendency to tilt toward "multiple drivers" policy).

It is important to note that the expansion of liability limits in 2015 led to a noticeable increase of the average premium for compulsory MTPL insurance, which forced most drivers to refuse purchasing "multiple drivers" policies, and ensured more careful attention to their claim history (bonus-malus system).

This transition was accompanied by complaints to the Bank of Russia in connection with an incorrect (incomplete history) calculation of the bonus-malus coefficient, which required the regulator to actively intervene in the activities of market participants.

CONCLUSIONS

In general, the development of the Russian MTPL insurance industry is similar to that of the economically developed countries. We assume it will lead to the liberalization of tariffs when insurers are able to set tariffs considering all risk factors.

In 2019, MTPL reform, aimed at individualizing of tariffs, led to the average cost reduction of the insurance, owing to the market competition and electronic form of MTPL. It contributed to the wide use of insurance policy in the country where 99% of vehicle owners purchased it[7]. In the first quarter of 2020, the average insurance premium decreased in 53 regions of Russia, where more than 72% of the population live[8]. However, COVID-19 will have a significant impact on these data and the in-

[7] Measuring people's attitude to MTPL insurance, February 2020. URL: https://www.consult-cct.ru/fakti/19573.html (accessed on 01.05.2020).

[8] URL: https://www.consult-cct.ru/itogi/19991.html (accessed on 01.05.2020).

surance industry as a whole. Therefore, it is important to update the MTPL tariffs regularly.

AIS MTPL database provides accurate information and actuarial data for any coefficients of the MTPL tariff formula. In addition, Casco voluntary insurance statistics should be considered for the MPTL tariff initiatives.

The study allowed us to verify theoretical assumptions and identify mathematical patterns of the age and driving experience coefficient and its components.

However, in case of a "multiple drivers" insurance policy it is not possible to consider factors of age and driving experience for a vehicle. Nowadays only telematics devices collect this information, but they are hardly used in Russia. The quality of data may be affected by outdated or invalid information provided by the insurance company in terms of payment.

We estimate the error rate to 5–7%; the segments of lower exposure are most affected by this. Another issue is inaccurate data on policy attributes or an insured event, which may impact the conclusions and forecast accuracy. The authors considered the error factors.

The research suggests a grouping of values by target groups ensuring a reasonable distribution of risks among citizens depending on their age and driving experience. Also, it shows that there are groups of population with an overrated risk (middle-aged and senior drivers of more than 10 years driving experience) and it is reasonable to lower MTPL rates for them; and policyholders with 3–6 years of driving experience (in particular, aged 22–29 years) for whom MTPL rates are significantly low considering their risk level.

The findings of the study are important for the MTPL insurance affordability discussions for senior drivers (including pensioners) in particular. The results may provide a mathematically-based foundation for revising MTPL pricing. It is possible and reasonable to introduce additional categories of drivers, considering the demographic changes and retirement-age increase.

A reasonable reduction in tariffs will increase the financial affordability of insurance services mainly for people of the older generation and will inevitably lead to the socialization of insurance services.

During the period of self-isolation aimed at reducing the negative consequences of COVID-2019, the use of personal vehicles decreased, the number of accidents and, accordingly, payments for compulsory MTPL and hull insurance decreased. A significant number of cars were not used, which led to the MTPL usage decrease. In future, payments will increase, as transport returns to the roads, and the cost of repairs will increase due to the ruble devaluation. Accordingly, this may be considered for the liberalization of MTPL tariffs. Also, these factors should be accounted for discounts for low- and high-accident drivers.

The fairness of tariffs recognized by the majority of the population for the most common type of insurance will undoubtedly have a positive impact on the development of the insurance sector in Russia.

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Tsyganov A.A.— defined the problem, developed the conceptual framework, performed the analysis of sources, contributed to the conclusions of the manuscript.
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