COMPULSORY AUTOMOBILE INSURANCE LAW AND CAR ACCIDENTS IN RUSSIA

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Abstract

The paper aims to discern the effect of mandatory auto insurance law on the number of car accidents in Russia. Panel estimation using data on several of the Russian regions over a period of six years – two years prior implementation of the law and four years after the implementation – shows that compulsory auto insurance significantly decreased the number of car accidents in the regions. While subject to some caveats, the conclusion is that the welfare implications of the mandatory auto insurance law have been positive.

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1 INTRODUCTION

According to Russian State Committee of Statistics (2008), the overall number of car accidents in the country in 2006 was 229,224 with 32,719 people being killed and 285,357 injured. Compared to overall number of deaths (2,166,700 people) this number becomes very important in studying the problem of the health of the nation. The problem becomes even more crucial if the rate of deaths with only external causes is taken into consideration. Now, the overall number of such deaths in Russia was 282,800 people in 2006. The share of car accidents caused deaths is almost 12%, which puts it in second place among all the external death causes, after suicides.

There can be no doubts that this factor is very important in the life of a society. However, the history of Russia in the late 20th century shows that the authorities were not paying much attention to this problem. Only in the late 90s government started implementing programs aiming to reduce the number of car accidents in the country.

In 2003 in Russia the compulsory tort liability automobile insurance policy was introduced. One of the main purposes of it was to reduce the number of car accidents in the country. However, it is not clear to what extent the policy has been successful.

The influence of different insurance policies on the number of car crashes received a lot of attention from the economists, particularly in the US. Conard (1964) claims that introducing the tort liability system in the USA has decreased the number of car accidents. Evidence from Vickrey (1968) based on US data leads to the same conclusion. He claims that a number of crashes decreased due to implementation of the tort liability system. However, he criticizes the system as being slow and inefficient. Keeton and O'Connell (1965) suggested that the USA should have switched from the tort system to the no fault liability, because the first

system was good at reducing the number of car accidents, while the second would have been better in terms of efficiency. Later, Cummins and Weiss (1991) estimated influence of the no fault insurance program in the USA on the number of car accidents. They prove that implementing this system did increase the number of crashes. However, it is explained with the fact that the no fault was implemented in some states in replacement of the tort insurance program, which had previously decreased the number of car accidents. Cummins, Weiss and Phillips (2001) further develop this idea and support it with new data; the results of this work are the same.

In the particular case of Russia, the effect of a tort liability system on the number of car crashes was discussed widely in the newspapers and various Internet resources. Surprisingly, most of the sources claim that no effect of the new auto insurance policy can be found, which is the opposite of the findings in US. Volchkov (2004) claims that the effect does not exist, and the number of car accidents kept increasing despite the new policy. Yakimov[1] (2004) during his parliament speech also said that the effect had not been discovered and demonstrated some statistics as evidence. However, the statistics used by Yakimov includes only the overall numbers of car accidents in Russia in two years, which does not make them a sufficient evidence of his claim. Another weakness of his report is that the estimation of the effect was made too early, just one year after the policy implementation. One year is not enough to fully estimate the effect of the new system.

This work uses an econometrics approach to this problem, taking into consideration different regions of Russia. In other words, many region specific factors that could have influenced the number of car accidents are controlled for. In this work four years after the policy

[1] Information about the Parliament session is taken from the article of RosBusinessConsulting, autonews.ru (2004).

implementation are taken into consideration, and the numbers are compared to those of two years prior to the introduction of the law.

In Chapter 2 a theoretical background of the car accidents is given. Chapter 3 gives a more detailed description of the particular situation in Russia, as well as the review of the exact policy that was implemented there. In Chapter 4 the data is described, and then the variables that are used in the regressions are reviewed, with their specific parameters presented in the table. The description of empirical investigation is presented with the results, which give the answer to the main question of the paper – what was the contribution of the compulsory auto insurance law on the number of car accidents in the country. Then the conclusion is made, whether the new auto insurance policy in Russia was useful for the country. Several policy implications are also suggested.

2 THE ECONOMICS OF CAR ACCIDENTS

Why is the number of car accidents in any country so important? There are two different ways of how this occurrence influences the society. The first effect of the number of car accidents in the country is the psychological influence on its citizens, which will be described in Section 2.1. In other words, individuals feel less secure in the society with high level of car crashes, giving rise to significant non-economic costs. The second effect is truly economic costs of the car accidents for the society of the country; more information about it is given in Section 2.2. The causes of car accidents are described further with the possible ways of reducing the probability of them occurring. Then, the idea of insurance as a mechanism of reducing the number of car accidents is developed.

2.1 Non-economic costs of car accidents

A higher number of crashes in the country leads to its citizens feeling less secure. The pain, suffering and psychological fear of being injured or killed in the car accident increase.[2] As the society is supposed to value human life and safety, it should be concerned with this problem and try to reduce the above-mentioned factors. In other words, the government is supposed to try to decrease the number of the car accidents in the country.

Surprisingly, in the economic literature we can find evidence of the opposite behavior of politicians, as well, meaning, they do not try to increase the traffic safety. MacLennan (1988) claims that due to high pressure on the politicians from automobile companies, the decisions of ruling elite for improving safety and reducing the probability of dying in a car accident were usually delayed. The process of implementing technological improvements is naturally

[2] The so-called psychological costs of car accidents are mostly the problem of medical sciences. It is difficult to evaluate them in terms of money. The idea of them existing, however, is widely acknowledged in the world. For more information about psychological costs of car accidents see Blanchard and Hickling (1997), van der Kolk (1997), Butler, Moffic and Turkal (1999).

long, but became even longer due to this influence on the politicians. Of course, such a behavior of the government would make it less popular among the citizens of the country. Another problem is the auto insurance market. The insurance companies would want the government to implement certain policies and will try to influence the government. It is a trade-off for the politicians, whether to make profits from getting a bribe for not doing anything, or to become more popular by trying to implement useful policies. So, it is not certain from the very beginning whether the ruling elite will try to reduce the number of car accidents in the country or not.

2.2 Economic costs of car accidents

Economic costs of traffic accident are all those that can be evaluated in monetary terms. Following Reynolds (1956), several types of economic costs of the car crashes are given here. The most obvious are the costs of the property damage. The costs of repairing or substituting the damaged vehicle with a new one are considered among those. Then, there exist costs of administrating different insurance policies. As the car accident is a matter highly related to insurance industry, it is a very important economic aspect of the traffic accident. The costs of medical treatment are the last important economic factor of the car crashes. These are the costs of treating the injured in the road accident people. It is also important to point out the non-measurable economic effects of the car crashes. For example, there might be a reduction in gross national product (GNP) due to the loss of output from the people who are killed or injured in car accidents. The government, which is concerned with increasing the welfare of the population, is supposed to try to reduce these costs decreasing the probability of car crash in the country.

2.3 Why car accidents occur

It is usually considered that there are four main reasons for a car crash to occur (Stern and Zehavi, 1990). They are: human factor, environmental factor, road condition and vehicle quality. They are, of course, all interrelated and usually several of them are reasons for the same crash having occurred.

2.3.1 Vehicle quality

Vehicle quality has generally been considered one of the most important reasons for the traffic accidents (Peltzman, 1975; MacLennan, 1988). It is quite hard to regulate this factor, because the industrial process is usually not open for the outsiders of the automobile companies, even for the authorities. But as the safety of a vehicle is one of its most valuable qualities, it can be concluded, that in the economy with perfect competition in the automobile industry, the safety of the vehicles produced will increase. The government does not have to do much about it, other than putting the lowest standard ("bright-line rule") – the minimal level of safety parameters that are demanded from the newly produced vehicles. However, in this work this problem is further discussed in the Section 4.2.

2.3.2 Road condition

Road condition is another crucial factor, which influences strongly the probability of a car accident. It is in government's ability to make sure that the roads in the country are in good condition and to repair them as soon and as well as possible. This way of regulating the road safety will not be discussed here, but the way this factor is controlled for in this particular work is discussed in Section 4.2.

2.3.3 Environmental factor

Environmental factor is a factor, which itself causes the traffic accidents, but also might influence the probability of the crashes through the roads condition. This factor itself is impossible to regulate. The environmental factor includes the climate of the place where the crash occurred, the weather at the exact time of the accident, the weather on several days before it. In any country, which is quite big, various parts of it have very different climate. The roads are constructed in different ways in order for them to be most suitable for the particular region. However, in case of storm there is not much the authority can do to prevent the crashes from occurring. Stern and Zehavi (1990) proved that the environmental factor is not crucial when the number of car accidents is discussed. Still the road condition might be influenced by the climate of the place where they are built. Of course, the technology of the road building today is highly developed, and different types of road covering are chosen for the regions with different climate, but still the weather and climate factors are important. The way of solving the problem of controlling this factor in this work is discussed in Section 4.2.

2.3.4 Human factor

Human factor is also very difficult to regulate, but it is not impossible. There are several ways of how the driver's behavior can influence the probability of the accident. According to Russian State Automobile Inspection (2008), for example, in 2006, 8% of all the car accidents in Russia took place because the driver was under the influence of alcohol.[3] In 14% of the crashes the drivers were caught not having the driving license with them. Other most important human-related factors are: not wearing seat belt, not having a special sign on the window indicating the studded tires installed, talking over cell-phone, smoking, eating, and

[3] The effect of alcoholic intoxication on the probability of a car accident, though quite obvious, was studied in the papers by Lloyd (1990), Levitt and Porter (2001a), Houston and Richardson, Jr. (2004).

trying to switch the radio or a CD.[4] It can be all summarized into the violations of the traffic rules, which are the outcome of the driver's moral responsibility and willingness to abide by the law. In this paper it is suggested that the drivers have individual levels of this responsibility, which can be influenced by the government through different laws and policies.

Of course, the human factor also includes the mistakes of the drivers, which have nothing to do with their moral responsibility. The mistakes of the drivers are not studied here, as they can not be influenced by the authority in any way.

2.4 Car accidents and insurance policy

One of the ways to influence the drivers' moral responsibility is changing the automobile insurance policy in the country, for example, making it mandatory. There are, however, two ways of how it might influence the behavior of the driver. On the one hand, he would probably become less caring and attentive knowing that he already has insurance in his pocket (Cummins and Weiss, 1991). On the other hand, the insurance programs are usually built in such a way, that the more accidents the driver has had in the past, the more expensive the new insurance would be for him (Appendix A). And if the insurance were mandatory, then the driver would probably behave more attentively.

There are different types of auto insurance. There exist mandatory and optional insurance packages in most countries. Optional coverage usually includes compensation for theft, fire or vandalism (Van der Laan and Louter, 1986). Sometimes it is also possible to purchase an optional insurance package to protect one's vehicle against collisions. However, in most

[4] The change in a probability of a car accident due to these safety measures being neglected was covered in the articles by Levitt and Porter (2001b), Dee and Evans (2001), Peltzman (1975).

countries now this protection is mandatory or quasi-mandatory and is called the liability insurance.

Liability insurance is usually divided into two categories: tort compensation and no-fault compensation. These policies are different in their attitude towards the criteria on which the decision is based on whether or not to satisfy the claim of the accident participant for the compensation of damage.

Tort compensation means that the liability notion implies only to those drivers who are found negligent in the context of the particular accident (Cummins, Weiss and Phillips, 1999). It implies that the problem of establishing the blame is there, so it makes the process more costly in this regard. Under the tort regulation it is usual that the victims of the car accident go to the court.[5]

According to initial design of the tort compensation system, it is supposed to increase drivers' attentiveness on the road. However, its implication in the US, for example, was highly criticized (Conard, 1964; Keeton and O'Connell, 1965). The opponents of the system claimed that most of the accidents come from the reasons, not related to the behavior of the drivers. Also, they argued that many claims were not compensated properly and so, the system itself was inefficient.

To solve these inefficiencies of the tort compensation system, the no fault compensation system was suggested in the USA (Cummins and Weiss, 1991). The no fault insurance is based on two main ideas. First, under the no fault system, the person injury in an accident, evaluated in economic terms, should be more than some threshold level in order for the person to demand compensation. It can be seen that the compensation under no fault system usually refers to health losses rather than property damage. Property damage under this

system is usually regulated with additional insurance policy. Second feature of the no fault insurance is that it implies so-called first-party coverage. It means that the injured person receives the coverage from his own insurance company; he does not have to go through lawsuits in order to get it. Both, no fault and tort compensation systems are widely used in the world (Cummins, Weiss and Phillips, 1999).

[5] For more information about tort liability insurance see Cummins and Tennyson (1992).

3 THE CASE OF RUSSIA

In 2003 in Russia a compulsory auto insurance program of the tort-compensating type was implemented. The main purpose of introducing this program was to reduce the number of car accidents by increasing the moral responsibility of the drivers.

The design of the program can be viewed as exogenous to the insurance companies, rather than endogenously developed by them. The evidence that exists seems to point to the direction that mandatory auto insurance is not as profitable as other types of insurance (Federal Service for Insurance Superision, 2006). Hence, had the insurance companies been able to collude and influence mandatory insurance program design from the very beginning, they would not have wanted the law to pass in its existing form.

The program is constructed in such a way, that each year the tariff for a particular driver is re-calculated. If the driver has not had an accident during the year, he receives a discount. If the accident takes place, the insurance becomes more expensive for this particular driver. The main purpose of the policy is to make drivers behave in a more attentive manner, increasing the road safety in the country.

The tariff structure (Appendix A) of the auto insurance policy, which was implemented in Russia, is fixed in the law. The main feature of the tariff structure is its dependence on whether or not the accidents occurred for the driver in a most recent year. It can be seen in table 1 that the basic price multiplier is drastically different for a driver who did not have an accident and a driver who had two of those. For example, the driver who had the insurance class 5 in the beginning of the year and has not had an accident during the year receives the coefficient 0.85 for the next insurance period and is awarded class 6. However, if the driver has had two car accidents, he is demoted to class 1 and will have to pay the tariff with the

coefficient 1.55. Every year in which the driver did not have an accident would slightly reduce the coefficient of the tariff for the next year, so this system must be very efficient in stimulating drivers' incentive of being more attentive on the road.

TABLE 1. Dependence of auto insurance tariff multiplier on the previous number of accidents

Driver's class in the beginning of the new insurance period	Coefficient (the multiplier of the insurance basic price)	Driver's class at the end of the insurance period as a function of the number of accidents he has had during the year				
		0	1	2	3	4 or more
M	2.45	0	M	M	M	M
0	2.3	1	M	M	M	M
1	1.55	2	M	M	M	M
2	1.4	3	1	M	M	M
3	1	4	1	M	M	M
4	0.95	5	2	1	M	M
5	0.9	6	3	1	M	M
6	0.85	7	4	2	M	M
7	0.8	8	4	2	M	M
8	0.75	9	5	2	M	M
9	0.7	10	5	2	1	M
10	0.65	11	6	3	1	M
11	0.6	12	6	3	1	M
12	0.55	13	6	3	1	M
13	0.5	13	7	3	1	M

Note: 1. M – the lowest class
2. Source of data: Decree of the government of the Russian Federation N739, dated December 8, 2005.

Other aspects that highly influence the tariff of a driver are: the age and the driving experience of the person, the engine horsepower capacity, the number of people that are allowed to use a particular car and the place where the vehicle will be used (Appendix A).

The problem of the young drivers being more susceptible to car crashes is as well acknowledged in the world, as it is unexplainable. Dee and Evans (2001) discovered the evidence of the younger people having a higher motor vehicle death rate, even more so, given

the fact that the non-motor-vehicle death rate for them is lower. They claim that according to the USA annual statistical reports, the highest death rate in the car accidents belongs to the age group of 15 to 24 years. One of the reasons for this phenomenon might be that the age of the driver is related to his use of alcohol. Indeed, the surveys of some US agencies (US National Safety Council, 2008; US Federal Highway Administration, 2008) show that there is a higher average alcohol concentration in the blood of the young drivers killed in fatal accidents. So, it is not surprising that the tariffs in Russian insurance program control for the age of a driver, and the tariff coefficient depends negatively on it.

Peltzman (1975) proved that the cars with higher maximum speed are more probable to get into car crash than those with the lower level of this parameter. Maximum speed of the vehicle is the function of the mass of the vehicle and its engine capacity. It has a negative dependence on the first parameter and the positive dependence on the horsepower of the car. That is why the horsepower of the engine enters the tariff of the auto insurance with a positive sign.

One of the most important features of the mandatory auto insurance program in Russia is that the tariffs are fixed in the law. It has been proved in the literature previously (Cummins and Tennyson, 1992) that the auto insurance prices grow rapidly if left on their own, even in case of competition on the insurance market. There are two main reasons for this phenomenon, suggested by the authors. First, there exists the possibility of collusion between the insurance companies, and second, the companies might try to cover the previous or possible future losses. The extra losses of the insurance companies usually come from excessive claims. For example, even if the driver was not injured badly, he still goes for the compensation.

The problem of collusion would be highly expected in Russia, as there are not many major players on the insurance market there. In the table 2 the list of the insurance companies of

Russia with the largest shares of the market is given. It is easy to see that if top five insurance companies colluded, they would control most of the market. Even though the tariff is fixed in the law and considered exogenous for the insurance companies, there is still a problem of bribery. If the insurance companies colluded, they could have influenced the initial decision of the authorities on the tariff coefficients and structure.

Another reason why the price of auto insurance would grow rapidly, if not regulated is that drivers tend to claim the covering of costs of the car accident, even if it is not necessary for them (Cummins and Tennyson, 1992). It is not only the problem of unregulated insurance, but it is present in case of tort liability in any case. It is widespread all over the world, so it is not to be neglected in case of Russia, too. Introducing the no fault policy instead of tort liability could solve the problem of excessive claiming. No fault compensation would stop the drivers from going for the compensation in case when they do not need it.

TABLE 2. The largest insurance companies in Russia, 2006

№	Company name	Overall premium, mln rbl.	Share on the insurance market (%)
1	Rosgosstrah	11664.2	12.33
2	RESO-Garantiya	10470.5	11.07
3	SOGAZ	9885.14	10.45
4	Rosno	7382.21	7.80
5	Ingosstrah	7275.99	7.69
6	VSK	5493.94	5.81
7	Jaso	4541.88	4.80
8	SG Kapital	4444.74	4.70
9	Maks	2414.46	2.55
10	Soglasie	2134.53	2.26
11	Alphastrahovanie	1983.39	2.10
12	Sheksna	1606.67	1.70
13	Yugoriya	1587.9	1.68
14	Natinal Insurance Group	1551.13	1.64
15	Nasta	1534.08	1.62

Note: Source of data is RosBusinessConsulting, 2007.

This work aims to answer the question, whether the tort compensating policy in Russia succeeded in reducing the number of car accidents. If the answer is positive, then the policy should remain. However, if the answer is negative, a policy worth considering in the future is no fault compensation, as it would likely alleviate the problem of excessive claiming.

4 EMPIRICAL ANALYSIS

4.1 The data

The data contain 24 regions of Russia over 6 years – from 2001 through 2006.[6] The discussed insurance policy was implemented in Russia in 2003. So, the data covers several years before and after that. Unfortunately, the statistics on the traffic accidents in Russia, which took place more than two years ago, is very difficult to find. So, the best that could have been found is the statistics on 24 different regions out of 83. This data was partially collected from the study of Barsovsky (2004) on the number of accidents in Russia and its dependence on the share of right-wheel vehicles in the region, which was previously collected from Russian State Committee of Statistics in 2004. The remaining part was found in Russian State Committee of Statistics (2008) and Russian State Automobile Inspection (2008).

The total number of observations is 144. The proxy for the dependent variable is the number of victims (both injured and killed people) in car crashes per 10,000 citizens. The independent variable of main interest is INS – a dummy, indicating if the auto insurance policy is in effect. The variable INS takes on the value of 0 (no mandatory insurance law) before 2003, and 1 (mandatory insurance law effected) in 2003 and after. All the variables with explanations, their mean values and standard deviations are given in Table 3.

4.2 Estimation method

To choose the correct estimation method, it is crucial that the proper type of data set representation is chosen. As the observations are taken in the same regions over several years, and the regions are compared to each other and to themselves in different years, the right choice would be to represent the observations as a Panel data. Panel data is a combination of

[6] In Appendix B the list of regions used in the regressions is given, with basic information about them.

time-series and cross-sectional analysis. Time-series analysis is used to capture the effect of changes in the same region over time, while cross-section is needed to compare regions with each other.

While running the regression it is necessary to control for region specific effects. It has been discussed previously that the number of accidents is highly dependent on climate. These weather conditions will be captured in a region fixed effect. Another problem that is solved with controlling for region-specific effect is the road condition. It is possible to assume here that during six years this parameter did not change much. So, among the four groups of factors influencing the probability of a car crash: human, environmental, vehicle-related and road conditions, only the human and vehicle-related are left.

TABLE 3. Variables used in the regressions

Variable	Meaning	Mean Value	Standard Deviation	Maximal value	Minimal value
INJURED	Number of people injured or killed in car accidents in a particular region during a year, per 10,000 people	24.23	7.42	47.3	8.76
INS	Indicator of whether the insurance policy was already in effect in a year when the particular observation is taken; 0 = no, 1 = yes			1	0
CARS	Number of cars in a particular region per 1,000 citizens, counted at the end of corresponding year	155.54	40.02	249.4	92.7
GRP	Gross Regional Product per capita, in roubles	91,225.6	66,565.23	493,189	18,947.2
AVSAL	Average salary, counted in every region over the calendar year, in roubles	7,060.34	3,719.44	18,842.1	1,763.8
UNEMP	Unemployment rate estimated in January of the year, %	18.34	11.67	56.4	3.9

Note: Source of data is EViews 5.1 statistics based on the numbers from Barsovsky(2004), Russian State Committee of Statistics (2008) and Russian State Automobile Inspection (2008).

Concerning the problem of excluding vehicle-related factor from the estimated coefficients, two ways of solving it are suggested. First, the number of particular vehicles (their brands or types) used in a particular region should not change a lot during six years. So, this will be captured in a region fixed effect and a time trend. Second, if the change in the number or quality of vehicles in a particular region has changed significantly, this is probably the outcome of increase or decrease in the welfare of the region's population. This change will be captured in a proxy for the economic situation.

Another factor that highly influences the number of crashes is law enforcement in the region, meaning the police force in it. The law does not imply the increase in this parameter, and we assume that the number of police officers remains approximately the same in each region and is captured in the region fixed effect.

To estimate the effect of the new insurance policy in Russia on the number of car accidents, the logarithmic form will be used. It is necessary, because many variables, such as Gross Regional Product, for example, and the dependent variable itself, are the variables with a trend. So, the results are thus easier to interpret and will appear in a more obvious way.

4.3 The variables

Running the regression with region fixed effects, it is necessary to control for some changing effects in the regions, too. The most important are economic and social situations in the regions.

As a proxy for the economic situation, the Gross regional product (GRP) is taken into consideration. GRP is not the only indicator of economic situation in the regions, but there are many other factors, too. The average salary is chosen as another proxy for economic stability. Both of these variables are clearly the variables with an upward sloping trend (see

Appendix C for the graphs). As the logarithmic form of the regression is chosen and the time trend is included, there is no need to take additional measures in order to get rid of this problem.

As a proxy for the social situation in the region, the unemployment rate is included. It is one of the most important factors indicating stability of the citizens' life. The higher level of unemployment would decrease the quality of life in the region. As a result, it might increase the probability of drivers getting into car accidents. This problem was covered widely in the literature, starting with a very important article by Ross (1940), who claimed that most of the traffic accidents are rather the problem of socio-psychological conditions of the participants, than the technological malfunction.

The number of cars per capita is another important factor that might influence the number of traffic accidents very much. This number is counted per 10,000 people. It is necessary to use this variable in the regression, because many crashes might take place simply because of the traffic congestion, having nothing to do with the drivers' attentiveness. The upward sloping trend would be expected for this variable. Indeed, this hypothesis is supported with the graphs (Appendix C). But the logarithmic form of it does not seem to have the same problem.

The dependent variable is the number of injured people per 1,000 citizens. It is used as a proxy for the number of car accidents in the region. It is very important to test this variable and especially its logarithmic form for stationarity.[7] To check whether the variables are stationary, the individual unit root test is used. The null hypothesis of the test is the existence of the unit root in the variable. If it is not rejected, then the unit root exists and the variable is not stationary. The results of this test are given in the Appendix D. The result is more an

[7] Stationary variable is a variable whose expected value and variance do not change with time or in a different position of observation, and the correlation between different observations in time depends only on the distance between them, but not on their absolute position in time.

evidence for existence of a unit root in the logarithmic form of the INJURED variable than against. There is also a significant chance of this variable having an autocorrelation. Having tested for that, using simple correlogram (Appendix E), the results show that the number of injured people has a partial correlation on the first lag, but does not seem to have a significant correlation with further lags. To solve these problems, the first lag of INJURED variable (in a logarithmic form) is included into the regression.

Looking at the graph of the INJURED variable, it can be concluded, that the behavior of this parameter is different in every region. In some regions the upward sloping trend is seen, while the others do not seem to have any trend at all. Thus, the regions probably have specific conditions, which define this behavior to some extent. Including the region fixed effect in the regression is designed to solve this problem.

4.4 Discussion of results

The regression of the logarithm of a share of injured people is run on the insurance policy dummy, as well as the logarithms of: number of injured people in a previous year, number of cars, unemployment rate and average salary in the region. Average salary is chosen over GRP as it is more likely to affect the psychological condition of drivers. The regional fixed effects are captured and Period White errors are taken into consideration in order to get rid of two anticipated problems: heteroscedasticity and serial correlation. The time trend, which is very likely to affect the results of the regression, is controlled for. The results of running the regressions are given in table 4.

TABLE 4. Regressions coefficients (region fixed effects included), logarithm(INJURED) as a dependent variable

	(1)	(2)	(3)
Constant	1.75*** (0.23)	1.73*** (0.23)	-7.07** (3.49)
INS	**-0.06* (0.03)**	**-0.07** (0.03)**	**-0.08* (0.04)**
log(lag(INJURED))	0.47*** (0.07)	0.47*** (0.07)	0.43*** (0.08)
@trend		0.01 (0.01)	-0.21** (0.09)
log(CARS)			0.16 (0.27)
log(AVSAL)			0.97** (0.45)
log(UNEMP)			0.09 (0.08)
Durbin-Watson Statistics	2.5	2.54	2.42

Note: 1. Period White standard errors are given in parentheses.
2. * - significant at 10% significance level; ** - significant at 5% significance level; *** - significant at 1% significance level.
3. @trend – time trend.

The variable of main interest (INS) turns out to have a significant negative effect on the relative frequency of car accidents. During four years after the mandatory insurance policy was introduced in Russia, the number of injured in car accidents decreased by 8% on average, in comparison to two years before that. It means that the policy was developed properly and implemented with a great use for a society of the country.

Economic situation in the region turns out to have an effect on the number of crashes. The expected effect of this variable would be positive as richer people can afford higher insurance expenditures and can repair their vehicles more often, thus, the level of their attentiveness on the road would be lower. Also, the richer the region is, the more expensive vehicles there are. This leads to them being more powerful, and this in turn increases the probability of them

getting into a car crash, in a way that has been discussed previously.[8] The results support this hypothesis and show that a little change in the economic situation changes the traffic safety drastically.

Controlling for social situation in each region in a particular year does not have a significant effect on the number of injured people. Even the number of cars per capita does not seem to be important for the probability of a crash. These parameters are probably captured in the regional fixed effects, and did not happen to change significantly during six years, so they do not appear significant in the results.

However, these results lead to a suggestion, that the implementation of the mandatory insurance program might have influenced not only the level of the car accidents, but also the speed of its change. To measure this effect, another regression is run. The dependent variable is now the difference in the logarithm of the INJURED variable. All the independent variables are presented in the same form as a dependent variable. Unfortunately, the average salary can not be used in the regression, as a technical problem occurs, probably because of the small sample size. Instead of the average salary, the GRP is used to control for the economic situation in each region. Also, the lag in the INJURED variable can not be used, for the same reason.

Again, the time trend is included in the regression. The regional fixed effects are included and the Period White errors are used to solve the problems of heteroscedasticity and serial correlation. The results are given in table 5.

[8] Also, for more information see Peltzman (1975), Winston and Mannering (1984).

TABLE 5. Regressions coefficients (region fixed effects included), difference in logarithm(INJURED) as a dependent variable

	(1)	(2)	(3)
Constant	0.13*** (0.02)	0.11*** (0.02)	0.13* (0.08)
INS	**-0.12*** (0.03)**	**-0.16*** (0.05)**	**-0.16*** (0.05)**
@trend		0.02 (0.01)	0.02 (0.01)
d(log(CARS))			-0.05 (0.27)
d(log(GRP))			-0.21 (0.37)
d(log(UNEMP))			0.16** (0.07)
Durbin-Watson statistics	3.02	3.12	3.08

Note: 1. Period White standard errors are given in parentheses.
2. * - significant at 10% significance level; ** - significant at 5% significance level; *** - significant at 1% significance level.
3. @trend – time trend.

Interestingly, the speed of the unemployment rate change shows significant influence on the speed of the change in the number of car accidents. If the growth of the unemployment rate accelerates, or the decline in it slows down, the same change occurs in the number of car crashes. Meaning, it grows faster or starts to decline slower. This is exactly the psychological effect that Ross (1940) was referring to. Indeed, the social situation in the region has an influence on the road safety there.

Now, the effect of introducing the mandatory insurance program is even more stable. The results of running the regression show that on average, the policy has changed the speed of car accidents level change in each region to the better. In the regions where the number of car accidents was increasing, its increase has slowed down. In those regions where this parameter was decreasing, this trend continued, but at a higher speed.

Introducing the new auto insurance program in Russia led to two positive effects on the car accidents in the country. Not only the new policy decreased on average the number of crashes, but it also had a positive effect on the speed of change in this parameter.

4.5 Some caveats

There are several weaknesses in a study made. The data collected is not full, and heterogeneous. There were several sources used, and so, the measurement error problem is probable to occur in this data. So, there might be an unpredictable bias here. However, simple analysis of the numbers did not show any particularly notable gaps or collisions in the data. So, the decision was made to use it in this work. Also, the problem might occur with the fact that the policy was introduced simultaneously in all the regions of Russia. However, the time trend is controlled for, and it might help solve this problem partially. Also, the study of this particular period in Russian history does not show any remarkable changes that would influence the whole country and change the traffic safety in several regions simultaneously. Given all this, reasonable confidence in the obtained results remains.

5 CONCLUSION

The overall conclusion is that the implementation of mandatory car insurance policy in Russia is in keeping with the findings in the US (Conard, 1964; Vickrey, 1968). The implementation of the law has been useful for the society of Russia, as it decreased the probability of car accident, approximately by 8 %. It has also influenced the speed of the change in the probability of car accidents, slowing down its increase in the regions where it had been increasing and accelerating its decrease in others. The policy implications are that the mandatory insurance program was relatively successful in Russia. Doing comparative analysis with some other countries would give more precise results on how large was this positive effect.

The authorities could consider the option for the country to switch from the tort to a no fault liability system. Using the examples from previous studies (Cummins and Tennyson, 1992; Boyer and Dionne, 1985) it can be seen that the no fault system might decrease the number of the claims by cutting off those that are not important. But at the same time, policy-makers should keep in mind that the above-mentioned studies have also proved the no fault policy to increase the number of car crashes in the country. As the tort liability system in Russia is proved by this study to be quite helpful, the switch to no fault is not advised in the nearest future.

APPENDIX A

Tariff structure of the mandatory auto insurance law in Russia[9]

TABLE A.1. Dependence of tariff multiplier on the previous number of accidents

Driver's class in the beginning of the new insurance period	Coefficient (the multiplier of the insurance basic price)	Driver's class at the end of the insurance period as a function of the number of accidents he has had during the year				
		0	1	2	3	4 or more
M	2.45	0	M	M	M	M
0	2.3	1	M	M	M	M
1	1.55	2	M	M	M	M
2	1.4	3	1	M	M	M
3	1	4	1	M	M	M
4	0.95	5	2	1	M	M
5	0.9	6	3	1	M	M
6	0.85	7	4	2	M	M
7	0.8	8	4	2	M	M
8	0.75	9	5	2	M	M
9	0.7	10	5	2	1	M
10	0.65	11	6	3	1	M
11	0.6	12	6	3	1	M
12	0.55	13	6	3	1	M
13	0.5	13	7	3	1	M

Note: M – the lowest class

[9] Translated from the Decree of the government of the Russian Federation N739, dated December 8, 2005.

TABLE A.2. Dependence of a tariff multiplier on the number of people allowed driving a particular vehicle

Number of people allowed driving a vehicle	Tariff multiplier
Limited	1
Unlimited	1.5

TABLE A.3. Dependence of tariff multiplier on age and driving experience of a driver

Age and driving experience of a driver	Tariff multiplier
Younger than 22 years old with a driving experience less than or equal to 2 years	1.3
Younger than 22 years old with a driving experience more than 2 years	1.2
Older than 22 years old with a driving experience less than or equal to 2 years	1.15
Older than 22 years old with a driving experience more than 2 years	1

TABLE A.4. Dependence of tariff multiplier on the engine horsepower

Engine horsepower	Tariff multiplier
≤ 50	0.5
> 50 and ≤ 70	0.7
> 70 and ≤ 100	1
> 100 and ≤ 120	1.3
>120 and ≤ 150	1.5
> 150	1.7

TABLE A.5. Dependence of tariff multiplier on the term of insurance

Term of agreement	Tariff multiplier
6 months	0.7
7 months	0.8
8 months	0.9
9 months	0.95
10 months and more	1

APPENDIX B

Regions of Russia used in the regression, statistics for 2006

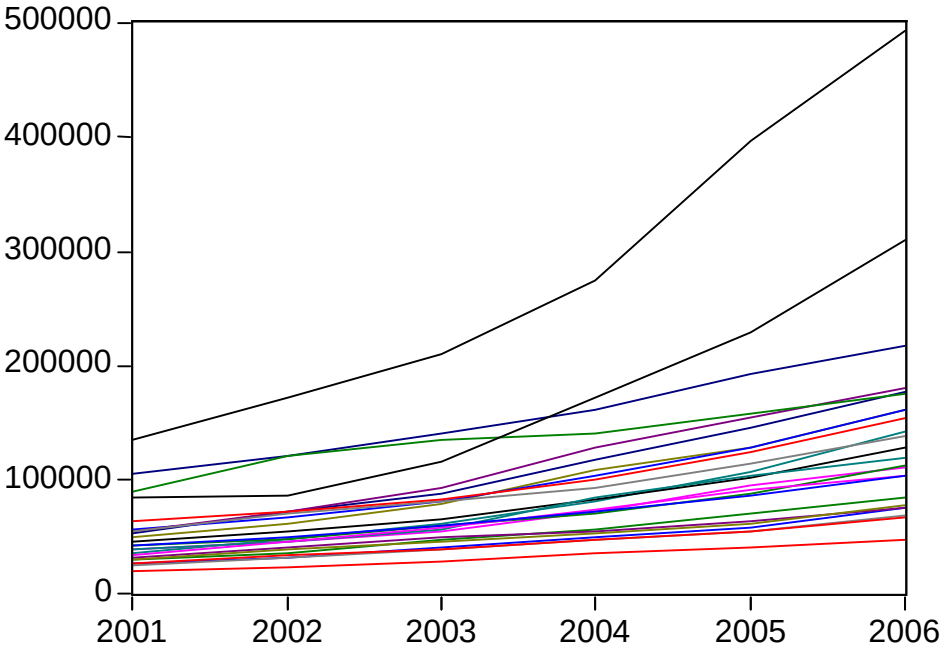
	GRP per capita, in roubles	Average salary, in roubles	Number of cars per 1,000 people	Unem-ployment rate, January, %	Number of injured people in car accidents, per 1,000 people
Vladimir region	76,328.1	7,434.90	147.00	17.10	34.61
Ivanovo region	47,949.8	6,362.60	124.70	12.90	29.21
Kaluga region	83,817.4	8,592.50	176.50	4.40	26.28
City of Moscow	493,189.4	17,997.90	246.50	34.00	17.55
Moscow region	141,396.4	12,263.40	241.00	33.70	32.37
Orel region	75,221.7	6,773.70	178.60	7.00	24.53
Arkhangelsk region	160,530.0	11,725.00	134.50	15.20	28.03
Saint-Petersburg	177,386.7	13,033.20	241.60	19.20	23.81
Novgorod region	110,666.0	8,907.50	155.00	6.00	27.66
Pskov region	68,713.3	6,973.00	175.50	11.90	29.38
Tatarstan republic	161,013.0	8,849.90	150.20	29.90	25.96
Kirov region	67,184.5	6,960.30	145.60	23.10	26.94
Nizhnij Novgorod region	112,161.7	8,111.70	152.30	14.80	22.31
Irkutsk region	128,276.6	11,103.10	151.90	32.60	21.29
Kemerovo region	119,124.2	10,407.70	153.90	49.00	18.41
Tomsk region	180,440.5	11,317.20	156.10	22.80	11.85
Zabajkalskij kraj	77,898.6	9,942.60	152.20	11.10	18.44
Republic of Sakha (Yakutiya)	216,691.5	16,167.50	136.10	12.10	12.41
Primorskij kraj	103,769.3	10,903.10	197.10	44.40	31.39
Khabarovsk kraj	139,270.5	12,887.60	156.70	27.30	26.08
Amur region	103,982.7	11,110.80	167.00	19.90	21.26
Kamchatka region	154,350.0	18,540.90	249.40	7.10	25.34
Magadan region	175,619.7	17,747.20	213.20	5.50	34.39
Sakhalin region	310,556.8	18,842.10	248.70	5.00	38.54

Note: data from Barsovsky(2004), Russian State Committee of Statistics (2008) and Russian State Automobile Inspection (2008).

APPENDIX C

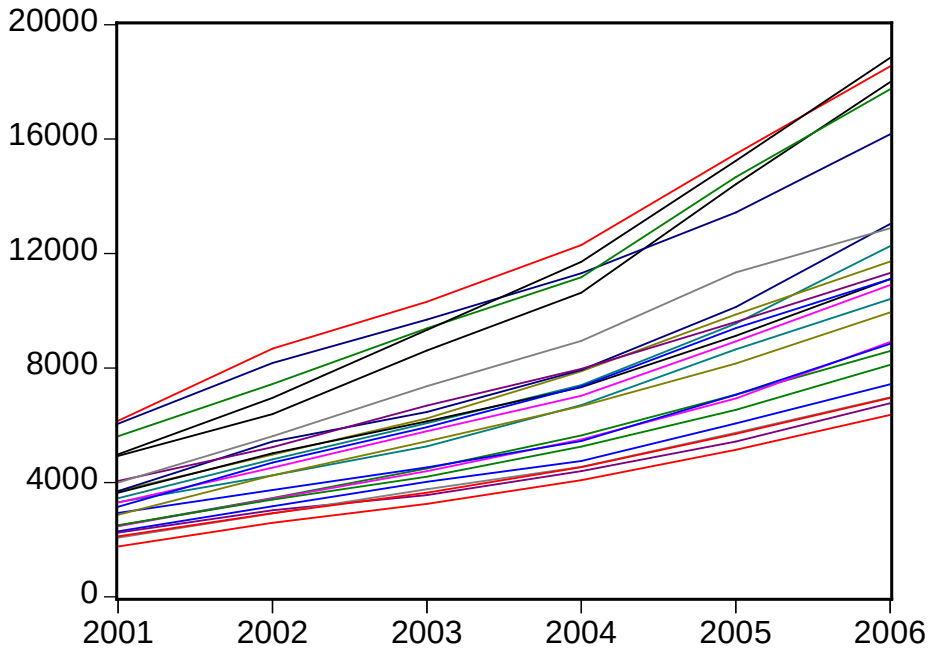
Graphs of the variables used in the regressions for all 24 regions[10]

GRAPH C.1. Graph of GRP variable, GRP per capita (roubles, year on the axes)

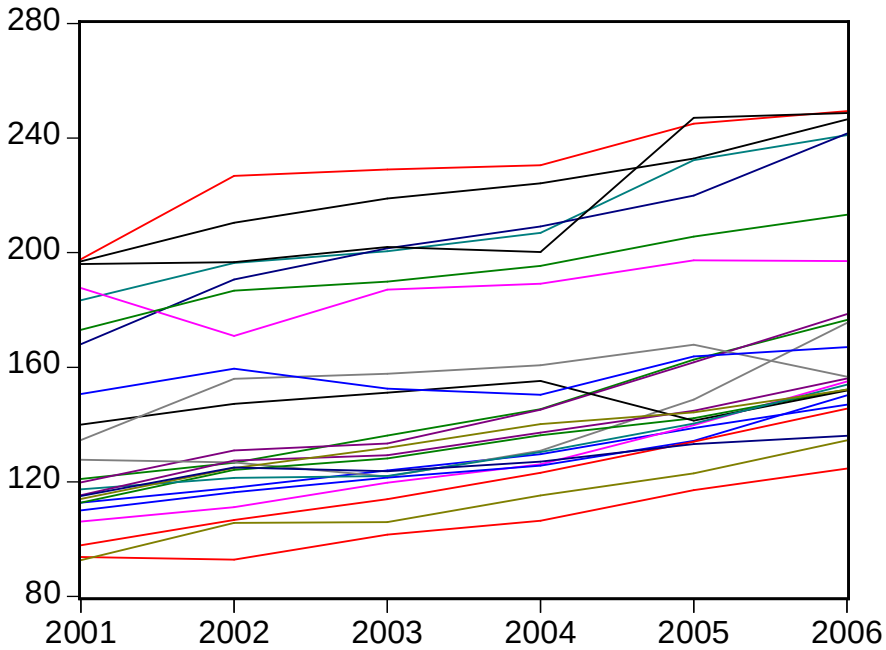


[10] Source: all the graphs were built using EViews 5.1 and data from Barsovsky(2004), Russian State Committee of Statistics (2008) and Russian State Automobile Inspection (2008).

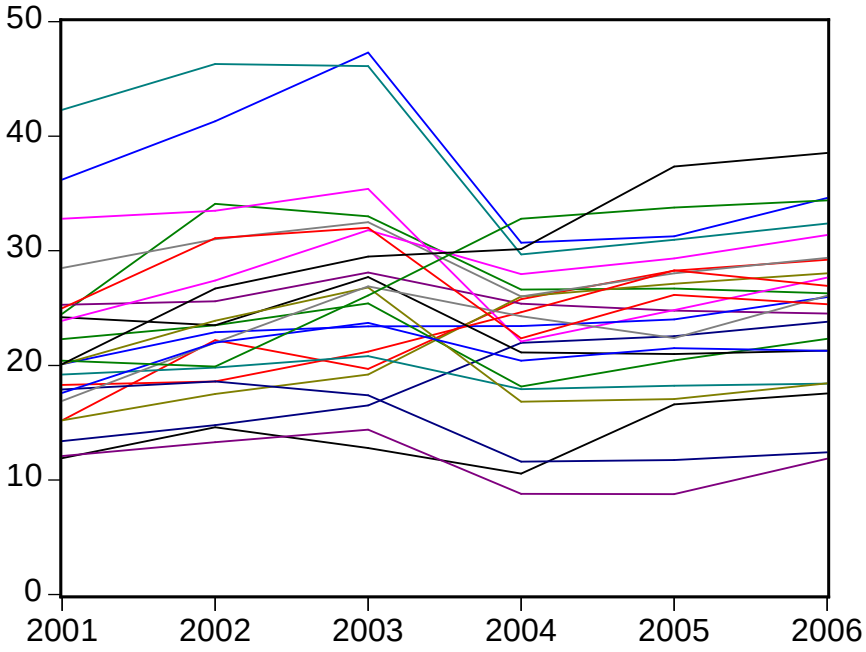
GRAPH C.2. Graph of AVSAL variable, average salary (roubles, year on the axes)



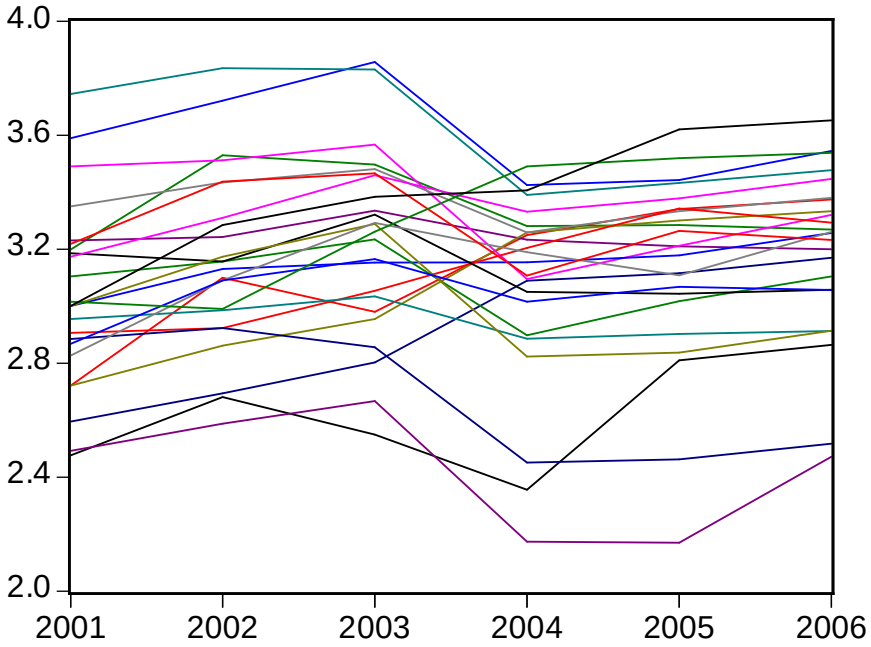
GRAPH C.3. Graph of CARS variable, number of cars per 1,000 people (number of cars, year on the axes)



GRAPH C.4. Graph of INJURED variable, number of injured per 10,000 people (number of people, year on the axes)



GRAPH C.5. Graph of log(INJURED) variable (log-value, year on the axes)



APPENDIX D

Unit-root test results for a log(INJURED) variable[11]

Null Hypothesis: Unit root (individual unit root process)
Date: 06/05/08 Time: 22:41
Sample: 2001 2006
Exogenous variables: Individual effects
User specified lags at: 1
Total (balanced) observations: 96
Cross-sections included: 24

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.29240	0.0981

** Probabilities are computed assuming asymptotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
1.000000	-1.0662	0.6096	-1.046	2.318	1	1	4
2.000000	-0.1949	0.8536	-1.046	2.318	1	1	4
3.000000	-1.7211	0.3593	-1.046	2.318	1	1	4
4.000000	-3.6168	0.0666	-1.046	2.318	1	1	4
5.000000	-0.8504	0.6834	-1.046	2.318	1	1	4
6.000000	-0.9092	0.6640	-1.046	2.318	1	1	4
7.000000	-0.7255	0.7231	-1.046	2.318	1	1	4
8.000000	-0.7450	0.7184	-1.046	2.318	1	1	4
9.000000	-0.9209	0.6605	-1.046	2.318	1	1	4
10.00000	-1.3473	0.4958	-1.046	2.318	1	1	4
11.00000	2.4687	0.9969	-1.046	2.318	1	1	4
12.00000	-2.5081	0.1689	-1.046	2.318	1	1	4
13.00000	-1.1613	0.5711	-1.046	2.318	1	1	4
14.00000	-0.5455	0.7692	-1.046	2.318	1	1	4
15.00000	-0.7642	0.7123	-1.046	2.318	1	1	4
16.00000	-1.4725	0.4472	-1.046	2.318	1	1	4
17.00000	-1.0100	0.6285	-1.046	2.318	1	1	4
18.00000	-0.9673	0.6433	-1.046	2.318	1	1	4
19.00000	-3.2322	0.0906	-1.046	2.318	1	1	4
20.00000	-3.4743	0.0744	-1.046	2.318	1	1	4
21.00000	-3.8820	0.0541	-1.046	2.318	1	1	4
22.00000	-1.1284	0.5849	-1.046	2.318	1	1	4
23.00000	-4.5500	0.0333	-1.046	2.318	1	1	4
24.00000	-0.4298	0.7976	-1.046	2.318	1	1	4
Average	-1.4481		-1.046	2.318			

[11] Source: the table was built using EViews 5.1 and data from Barsovsky(2004), Russian State Committee of Statistics (2008) and Russian State Automobile Inspection (2008).

APPENDIX E

Correlogram of the log(INJURED) variable[12]

Date: 06/02/08 Time: 22:34
Sample: 2001 2006
Included observations: 144

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.720	0.720	76.159	0.000
		2	0.482	-0.074	110.58	0.000
		3	0.306	-0.028	124.52	0.000
		4	0.170	-0.041	128.88	0.000
		5	0.066	-0.042	129.54	0.000

[12] Source: the correlogram was built using EViews 5.1 and data from Barsovsky(2004), Russian State Committee of Statistics (2008) and Russian State Automobile Inspection (2008).

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