UNEMPLOYMENT AS A FACTOR INFLICTING HIGHER CRIMINALITY IN THE SLOVAK REPUBLIC

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Abstract: *Crime is a serious problem in every society in the world. The aim of this paper is to explain the relationship between crime and unemployment in the Slovak Republic. The study uses panel data from all 8 regions in the Slovak Republic for the period 1997 - 2019. To determine the relationship econometric techniques are used in the form of OLS estimator. In the chapter Results, we estimate 4 different forms of models that use fixed as well as time effects of individual regions. Correlation analysis showed weak to moderate links between different types of criminal activity and unemployment. The estimated coefficients of the models indicate weak impact of unemployment and lagged unemployment rate on crime in Slovakia. Theoretical perspectives of crime-unemployment relationship could be accepted only to a small extent. The statistical significance of the estimated models is weak, which means that unemployment is not one of the driving factors of crime in Slovakia.*

Keywords: Crime; Unemployment; Motivation; Opportunity; Violence

1. Introduction

The social environment is a very interesting subject of research for the general public and academia. There are many factors that can have a major impact on criminality not only in terms of social environment. Generally, it is very difficult to claim that the factors that affect crime, also cause it. Of course, there is a relationship between them through which the social environment and crime interact. This article focuses on the identification of the relationship between unemployment and crime in the conditions of the Slovak Republic. Crime and unemployment are among the biggest social problems. Both significantly affect the quality of life of the individual, and society. Moreover, they are also both important issue for economic policy, and thus play an important role in political life. The crime-unemployment relationship is therefore relevant and interesting because of its importance for policy makers.

For several decades, economists but also representatives of other disciplines and social policy interest in the question of the relationship between unemployment and crime. Many studies have been carried out on this topic, which have yielded various results. Some economists argue that raising the unemployment rate will increase criminal activity because people who have lost their jobs are more motivated to commit a crime (Levitt, 2001). Thus, there is a positive correlation between the variables, and as one variable increases, so does the other. On the contrary, the findings of other authors (Cohen, 1981; Britt 1994) point to the exact opposite. Their results show a negative correlation between the variables and that criminal activity also decreases with the decline in unemployment. This relationship is justified by the fact that people to a greater extent remain in their homes, thereby protecting their property, and therefore it is difficult to commit property crime activity.

What is the relationship between unemployment and crime? Is it positive? Negative? Is there any relationship at all between these variables? We will explain the answer to these questions by analysis using econometric modelling on the following pages of our paper.

2. Literature review

Significant interest in the study and research of crime in relation to unemployment appears in the second half of the 20th century, specifically in the 1960s. An eminent work was an article by Becker (1968), who was the first to choose an economic approach to solving the problem. It was followed by a series of many research articles that dealt with this issue.

Britt (1994) assumed that most criminal activity is committed by juveniles up to the age of 20. Therefore, examined the relationship of crime and unemployment on data consisting of time series of adolescents aged 16-19 years in the US for the period 1958 - 1990. The research results suggest that violent criminal activity (murder and aggravated assault), as well as property criminal activity (robbery, burglary, larceny, car theft) are negatively correlated with the unemployment rate of juveniles. The effect of the year-on-year change in unemployment is positively correlated with criminal offenses, but it is statistically significant only in the case of robbery, burglary and larceny. Car thefts are negatively correlated with the unemployment rate.

Cantor and Land (1985) used time series data for research in the United States. The period of their research deals with the period from 1946 to 1982. The authors test two hypotheses:

1. The unemployment rate in year t will have a negative effect on fluctuations in criminal offenses in a given year - the opportunity effect.
2. Year-on-year change of the unemployment rate will have a positive effect on fluctuations in criminal offenses in the coming year - a motivational effect.

In the case of burglary, robbery and larceny, the results of their research are in line with what they expected. Rape and aggravated assault did not show any consistent link with unemployment rates or fluctuations.

In the literature focused on crime-unemployment relationship, two views are very often mentioned. Motivational view assumes positive relationship between crime and unemployment and the adverse economic conditions of life. However, we can talk about two different sources of motivation to commit crime. One of them is a frustration. Greenberg (1977, 1985) argues that frustration comes from the situation that people are not able to keep or get a job but at the same time trying to keep or even increase their standard of living. Based on this statement, we assume that if the economic conditions of the population deteriorate, for example through redundancies and rising unemployment, frustration will spread among people more quickly and the share of the frustrated group of the population in the total population will increase. Increased frustration will ultimately lead to an increase in crime. Becker (1968) names the second source of motivation a result of the comparison of costs and benefits of an individual who is considering whether to become a criminal or live a legitimate life. As in the case of frustration, it is assumed that this source of motivation also supports an increase in crime among unemployed people. The individual assumes that the total cost of committing a crime is relatively low compared

to the profit that the crime will bring. In both cases, it can be argued that poor economic conditions result in an increase in crime, as the proportion of the population prone to crime increases.

The opportunity perspective speaks of crime as a function of offering potential offenders and a function of offering suitable targets on which crimes would be committed (Britt, 1994; Cohen, 1981). The difference between the opportunity and the motivational view of crime lies in the expected effect of unemployment on crime. On opportunity effect, there is a presumption that in the event of deteriorating economic conditions, e.g., rising unemployment, crime will fall. The theory behind this statement is that if the economy is in a state of economic downturn (recession) and unemployment is rising, people are buying less property and the movement of people is reduced, meaning, that people stay more in their homes. We assume that property crime, e.g., robberies or burglaries are more common in cases where homeowners are not present. From this point of view, unemployed people act as a kind of protection of their property and prevention of criminal activity. Of course, it is not possible to claim that the influence of the opportunistic factor will reduce crime to zero, but the risk of theft or rape can be significantly reduced by its influence. The occasional effect is more pronounced in the investigation of property crime than in violent crime.

Fougère et al. (2009) examined the relationship between unemployment and 17 different types of criminal activity. The authors used panel data for 95 French departements for the period 1990-2000. The results of their research point to a positive relationship between the observed variables. The authors argue that reducing youth unemployment would lead to a reduction in some crimes, such as robbery or burglary. The study also shows that some types of crime have not shown any relationship with unemployment.

Altindag (2012) used panel data created from a group of 33 European countries in his research and thus examined the relationship between variables in a cross-sectional sample for several countries. The author pointed out the positive relationship between unemployment and property crime. We also use panel data, which are only for the Slovak Republic, but it is divided into 8 regions, each of which forms a separate panel.

An interesting work is the study by Sachsida et al (2010), in which the authors found a positive relationship between crime, income inequality and unemployment in Brazil. According to their findings, poverty does not have a significant impact on crime. However, what has a significant effect on crime is income inequality, in which the authors have discovered a one-sided causal relationship, and thus it can be said that income inequality is one of the factors that create crime. In contrast, some studies (Tang, 2010; Hamzah and Lau, 2013) have found a positive correlation between poverty and unemployment.

Using Granger's causality test, Narayan and Smyth (2004) examined the relationship between various types of crime and youth unemployment and the real average weekly income of men in Australia from 1964 to 2001. Using the concept of cointegration, they concluded that fraud, murder, and auto-theft are linked to youth unemployment and real average weekly income.

Edmark (2005) examines the relationship between unemployment and property crime in the Swedish environment in a period 1988-1999. The author of the research uses panel data to reveal the relationship and estimates models using

fixed effects. In the model, the author includes socio-demographic variables, but also dummy variables that capture the effects of individual regions and time. The research results shows that unemployment has a positive and statistically significant effect on some types of property crime - burglary, car theft and bicycle theft.

Fallahi, Pourtaghi, Rodríguez (2012) focus in their study on the effect of the unemployment rate on the volatility of crime in the USA. The authors found that integrated or long-term relationships occur only in burglary and theft of motor vehicles. The results suggest that the unemployment rate has a significant impact on burglary and theft of motor vehicles only in the short term, and unemployment volatility has a negative impact on theft of motor vehicles regardless of the time span. However, in the short term it has a positive effect on burglary and in the long term no effect.

Economists Thornberry and Christenson (1984) examined the reciprocal relationship between crime and unemployment. In their work, they argue that variables are interdependent, which means that one affects the other and vice versa. Thus, there is backward causality between the variables, and therefore it cannot be clearly stated that higher/lower unemployment causes higher/lower crime. The results of their reciprocal model are significantly more accurate than models that consider one-way causality.

3. Methodology

The data in our research represent 8 types of criminal activity - murder, rape, aggravated assault, robbery, burglary, larceny, car theft and drug crime, which will act as a dependent variable. Independent, and thus explanatory variable is the unemployment rate and the unemployment rate of the previous year (lagged). Data are collected for 8 territorial units (regions) in the Slovak Republic[43]. Thanks to the division of total data for the Slovak Republic into 8 regions, it is possible to create and use panel data for analysis, which allows us to include fixed effects, and thus unobserved effects that could cause a potential bias of the estimated coefficients. Data on criminal offenses were collected from the database of the Ministry of the Interior of the Slovak Republic. The unemployment rate for each region was obtained from the Datacube database of the Statistical Office of the Slovak Republic. All data were collected for the period 1997 - 2019 and form a balanced data panel. Descriptive statistics are given in Table 1.

Table 1 Descriptive statistics

Variable	Source	Mean	St. deviation	Min	Max
Murder	A	12.34	6.027	2	30
Rape	A	17.67	8.25	1	42
Aggravated assault	A	355.46	153.8	79	755
Robbery	A	143.82	90.47	10	508
Burglary	A	2061.19	1223.17	304	5707
Larceny	A	68.26	21.04	27	153
Auto theft	A	512.63	526.21	63	3055
Drugs	A	190.65	227.45	16	1256

[43] Bratislava, Trnava, Trencin, Zilina, Nitra, Banska Bystrica, Presov, Kosice

Unemployment	B	11.99	6.33	1.98	26.02
Number of observations is 184. A – Ministry of the Interior of the Slovak Republic B – Statistical Office of the Slovak Republic					

Source*: own calculations*

The research methodology occurs in several authors (e.g., Levitt, 2001). As time series are non-stationary and show a certain trend over time, it is necessary to eliminate this trend. By controlling the time and region fixed effects are used data detrended, which ensures stationarity, and therefore it is not necessary to use the first difference, but we can use lagged variable instead (see Results section). In this way, it is possible to better capture the impact of unemployment and unemployment from the previous year on the crime. The estimated model has the following form:

$$C_{it} = \beta_0 + \beta_1 U_{it} + \beta_2 U_{it-1} + K_{it} + T_{it} + \alpha_t + \varepsilon_{it} \qquad (1)$$

Where:

- C_{it} is the number of crimes in the region i at time t
- U_{it} is the unemployment rate in the region i at time t,
- K_{it} is the fixed effect of the region i at time t
- T_{it} is the fixed effect of a given year at time t
- α_t is the region x time trend
- ε_{it} is the error term

The parameters β_1 and β_2 are the parameters we estimate and are most interested in, and β_0 is the constant.

According to Levitt (2001), there are three main advantages of using panel data analysis in a relation of crime and unemployment.

Firstly, since the panel data consist of multiple observations of the same entity over a longer time period, it is possible to eliminate the so-called time-fixed effects. Therefore, it is possible to control any unobserved shocks that affect the whole country (as the example could be the changes in the economic policy of the country or demographics). It is also possible to take into account the modelling of fixed effects of individual entities, which in our case represent individual regions of Slovakia. In this way, it is possible to control comparisons using variations within the regions and not across them. Both methods make it possible to control differences, which are only very difficult to quantify. With the involvement of variables controlling characteristics that do not change over time, the big advantage is that the model only takes into account the characteristics of the monitored entities that change over time. In models, in which the fixed effects of regions and time are incorporated in the regression, the estimated coefficients come only from changes within regions over time.

Secondly, panel data provide an advantage in the form of a high number of degrees of freedom that allow you to control the large number of time-varying factors that may be correlated with both unemployment, as well as crime and unlike the time series of nationwide lead to unbiased estimates. As an example, variables such as the number of prisoners, alcohol consumption or changes in income inequality.

The third advantage is the use of variance, which offers the distribution of data into smaller units compared to data that describe the economy as a whole. It is almost certain that each monitored entity (in our case a region) has a different rate of unemployment and crime, and therefore there are regional differences between

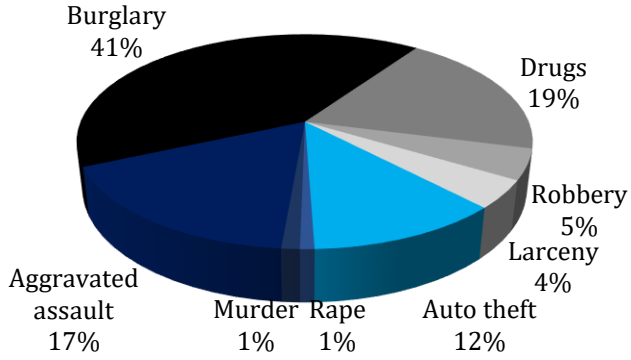
them. The disaggregation of time series at the whole level into several smaller units allows the use of variance in this data.

There are also some possible disadvantages/weaknesses connected with the use of panel data. One of them is the use of the time and region fixed effects. By using these dummy variables, it is possible to identify only a short-term relationship between the observed variables. The author claims that if there is a high correlation between variables across the observed regions (in our case fixed effects of individual regions) or across time (observed years), then there is only a low variance, which makes it possible to correctly estimate the coefficients.

4. Results

The chapter Results deals with the interpretation of the results of econometric models that we have estimated. Before we look at the correlation between the different types of crime and unemployment rate, it is important to look at the structure of crime in the Slovak Republic.

Figure 1. Structure of crimes in the Slovak Republic, 2019



Source: Ministry of the Interior of the Slovak Republic

Figure 1 shows the structure of criminal offenses in the Slovak Republic in 2019. The figure shows only those criminal activities that later enter the econometric analysis. The most frequent crime in 2019 in Slovakia was burglary (3 693 cases) with 41% of the total number of all crimes. Most burglaries are recorded in the Bratislava region (717). They are immediately followed by drug crime, where 1 791 cases were recorded, most of them again in the Bratislava region (405).

Of the violent criminal activities, we observe that the most frequent cases of aggravated assault were recorded (1 518), the highest number of which was in 2019 in the Zilina region (289). If we divide the total observed crime into violent crime (murder, rape, personal injury) and property crime (burglary, robbery, larceny, car theft), we see that violent crime accounts for only 19% of recorded crimes. Property crime up to 62%. The remaining 19% is attributed to drug crime, which we do not classify as violent or property crime.

Table 2. Correlation matrix

	Murder	Rape	Assault	Robbery	Burglary	Larceny	Auto theft	Drugs	U**
Murder	1								
Rape	0.364	1							
Assault*	0.443	0.661	1						
Robbery	0.575	0.524	0.525	1					
Burglary	0.621	0.598	0.770	0.742	1				
Larceny	0.191	0.111	-0.013	0.506	0.274	1			
Auto theft	0.529	0.109	0.141	0.646	0.578	0.526	1		
Drugs	0.195	-0.168	-0.309	0.387	0.032	0.615	0.587	1	
U**	0.220	0.451	0.651	0.124	0.419	-0.353	-0.285	-0.542	1
*Aggravated assault ** Unemployment									

Source: *own calculations*

By calculating the correlation coefficients, it is possible to lay the foundations of econometric analysis and thus determine the strength of the links between the observed variables. Table 2 provides an overview of the links between all types of crime. It is worth looking at the correlation coefficients for robberies, which acquire high values (apart from the correlation with unemployment). Based on these coefficients, we could say that during the robbery there will be a murder (0.621) or a car theft (0.646). The relationship between drug-related crime and aggravated assault (-0.309) offers interesting value. According to this coefficient, there is an inverse relationship between the variables, and it can therefore be argued that, in addition to drug crime, violence in the form of bodily harm is reduced. However, we are most interested in the last row of the table, which shows the strength of the links between different types of crime and unemployment. We observe the strongest relationship with aggravated assault (0.651), which suggests that people losing their jobs are frustrated and increase their nervousness and aggression, which results in violent crime. We also observe a positive relationship in other violent acts - the murders of 0.220, or rape (0.451). On the other hand, in case of property crime, the coefficients are negative for larceny (-0.353) and car theft (-0.285), which supports the theory of opportunity effect. The robbery coefficient is 0.124, indicating a weak link to unemployment.

The values obtained by correlation analysis indicate a pairwise correlation between the variables. The sign in front of the correlation coefficient provides a good insight for what signs can we expect for unemployment coefficients (β_1 and β_2) in the estimation of econometric models.

To be able to accurately quantify the relationship between crime and unemployment, it is necessary to perform a regression analysis model in which the dependent variable represents different types of criminal activities and regressors are the unemployment rate and lagged rate of unemployment (t-1). Table 3 presents the results of these regression models. The table lists 4 different variants of each model with respect to whether they control region fixed effects, time effects, and the interaction variable for time and fixed effects. Models with a linear time trend were also estimated, but their results did not differ, which we attribute to the fact that all

time effects are absorbed in fixed time effects. Robust standard errors are shown in parentheses below the individual coefficients.

Models (1) do not include any effects or interactions and are therefore estimated as cross-sectional data. The coefficients are positive for 7 out of 8 (excluding drugs) crimes, which contradicts the opportunity effect hypothesis. The results of these models do not support theoretical assumptions. We expected the opportunity effect mainly in connection with property crime, as this effect presupposes an increase in the number of people staying in their homes and thus higher protection of property. On the contrary, for all types of property crime, the coefficients are positive. For the crimes of homicide (0.480), aggravated assault (13.312), burglary (143.851) and car theft (26.050), the estimated coefficients are statistically significantly different from zero, indicating that an increase in unemployment leads to an increase in violent and property crime of this kind. Thus, there is a rather motivational effect and frustration, which causes people to be unable to cope with job loss and lost income. In the case of drug related crimes, the coefficient is negative as expected, but together with other crimes and unfair activity it is not statistically significant. Looking at the lagged unemployment rate, the rape coefficient is statistically significant (0.463) and even has the expected positive sign. Thus, there is a motivational effect to commit crime. Statistical significance can be noticed also in property crime through larceny (-1.754), auto theft (-7.128) and even in drug-related crime (-19.936). However, this coefficient acquires a negative value and refuses the hypothesis of the motivational effect, which assumes a positive sign in unemployment with a one-year lag. However, we assume that the model specification is not complete and there are other factors that are not included in the model and need to be considered. Therefore, we consider these estimates to be biased by the omitted variable. We can control them by implementing of fixed and time effects, which take into account the influences that do not change over time (fixed effects of the regions) and possible shocks that occurred during individual years. That is a reason why the models estimated on the panel data have a higher informative value.

The results of models with included fixed and time effects and their interaction can be observed in columns (2) - (4). Models (2) include fixed effects of individual regions and thus allow to control influences that are time-invariant. Models (3) control for both region and time fixed effects, e.g., inflation or demography. Thus, that the identification of model comes only from changes within the counties over time. The latest models (4) control as time, as well as fixed effects and include interaction term, which allows us to capture unobserved influences, which vary over time.

Table 3: OLS regressions (full model)

	(1)			(2)			(3)			(4)		
Dep. variable	Constant	U	U(t-1)	Constant	U	U(t-1)	Constant	U	U(t-1)	Constant	U	U(t-1)
Murder	9.831***	0.480**	-0.282	5.013***	0.497**	0.093	10.820***	0.677	-0.434	11.607*	0.465	-0.179
	(1.085)	(0.192)	(0.207)	(1.149)	(0.196)	(0.185)	(2.659)	(0.568)	(0.604)	(4.981)	(0.493)	(0.511)
Rape	9.955***	0.153	0.463*	10.166***	0.117	0.481	12.807*	0.233	0.203	20.183	0.227	0.075
	(1.172)	(0.228)	(0.259)	(1.795)	(0.205)	(0.280)	(5.628)	(0.504)	(0.648)	(11.955)	(0.509)	(0.797)
Assault[A]	159.406***	13.312***	2.480	119.455***	13.206***	5.825**	399.746***	16.619***	-12.741**	417.808***	17.505***	-13.402**
	(17.430)	(4.139)	(4.171)	(26.226)	(3.267)	(2.113)	(66.625)	(4.477)	(4.972)	(72.564)	(4.301)	(4.506)
Robbery	120.914***	2.160	-0.257	63.644**	1.908	4.636*	232.888**	-2.618	-3.299	276.809***	-5.699*	-2.237
	(19.614)	(2.510)	(3.035)	(18.515)	(1.707)	(2.352)	(87.630)	(2.753)	(5.266)	(48.963)	(2.566)	(5.051)
Burglary	1,076.387***	143.851***	-66.704	119.805	142.637***	12.115	3,580.561***	-56.243	62.024	3,518.892***	-84.987	95.926
	(200.497)	(36.233)	(40.911)	(297.870)	(26.898)	(27.328)	(926.130)	(86.752)	(82.681)	(765.941)	(57.249)	(95.817)
Larceny	84.134***	0.450	-1.754***	74.863***	0.413	-0.966*	88.475***	-0.083	-1.630	105.016***	-0.925	-1.064
	(4.263)	(0.575)	(0.637)	(3.388)	(0.449)	(0.422)	(20.250)	(1.011)	(1.828)	(25.665)	(1.009)	(2.134)
Auto theft	819.238***	26.050*	-51.752***	236.307***	27.007***	-5.370	2,220.808**	-85.413*	4.880	2,265.666***	-108.368**	28.292
	(115.510)	(13.523)	(15.966)	(21.848)	(6.817)	(6.000)	(718.238)	(43.068)	(16.476)	(506.249)	(33.397)	(21.405)
Drugs	448.275***	-0.674	-19.936***	302.960***	-1.253**	-7.578**	74.766*	12.961	-17.169	76.101	13.668	-23.650
	(49.489)	(4.938)	(6.090)	(34.369)	(0.519)	(2.985)	(39.017)	(7.725)	(9.902)	(75.871)	(10.760)	(12.653)
Observations	184			184			184			184		
Fixed effects	NO			YES			YES			YES		
Time effects	NO			NO			YES			YES		
Fixed x Time	NO			NO			NO			YES		

Robust standard errors in parentheses.
A – Aggravated assault
*** 99 % statistical significance; ** 95 % statistical significance; * 90 % statistical significance

Source: own calculations

A comparison of models involving only region fixed effects (2) and both fixed effects (3) shows that time effects have a more significant impact. From this, we conclude that the correlation between crime and unemployment is stronger over time than space. In models with fixed effects, up to 5 types of crime appear statistically significant and we consider the estimated coefficients to be consistent in comparison with previous ones. A more significant change occurred in estimates of the impact of the lagged unemployment rate, where there was a statistically significant motivating effect in aggravated assault (5.825) and robberies (4.636). However, estimated coefficients are not as significant as in models with time effects included. Again, the hypothesis of an opportunity effect of unemployment was not confirmed, as the coefficients lost statistical significance. The exception are the offenses of property crime by the theft of a car, wherein the coefficient is negative (-85.413), and a statistically significant on 90 % level. The expected sign is also when estimating lagged unemployment, which would confirm the motivational effect. However, the coefficient is not statistically significantly different from zero, and therefore we cannot claim that the unemployment rate from last year statistically significantly increases the number of car thefts. Looking at the models (3) with added time effects, the statistical significance of the coefficients is almost completely lost. The values of the estimated coefficients change their character. In all property crimes, the values fell to negative numbers, which supports the theory of the opportunity effect. In case of violent crimes, the coefficients remain statistically insignificant, except aggravated assault. Lagged rate of unemployment is statistically significant coefficients only in case of aggravated assault (-12.741). Models (4) provide an insight into the involvement of both the fixed effects in models and the interaction term. The violent crimes coefficients are relatively consistent. We observe a slight increase in the effect of unemployment and, conversely, a decrease in the lagged unemployment rate in aggravated assault. The statistical significance of the coefficients changed only a little. At the level of 90% significance, the effect of unemployment in robberies was manifested, and thus the opportunity effect was revealed.

Since we assume that between the unemployment rate and the lagged unemployment rate is some collinearity, in Tables 4 and 5 are shown estimates of the same models in abbreviated form. Comparison of full models in Table 3 with similar models in Tables 4 and 5 indicate the effects of the variables on different types of criminal activity are different in the case when it is estimated alone. In the abbreviated model of unemployment (Table 4), we observe that most of the coefficients are underestimated. On the contrary, they are overestimated in the approach to assault and rape. Signs of coefficients are however, in both cases the same. The unemployment rate in the previous period (Table 5) shows less consistent estimates of the coefficients, in comparison with the coefficients for violent crime, which are big. The exception is larceny and rape, the coefficients of which are relatively consistent across all model specifications. The change in the coefficients for burglary from negative to positive in model (1) is interesting, but also large differences in other models. We observe that the effect of the unemployment rate from the previous period is significantly suppressed in burglaries if the unemployment rate in contemporaneous year is also added to the model. In addition, it demonstrates a high statistical significance, which suggests that its presence in the model is justified. In other property crimes, we observe similar transformations of coefficients as in burglaries. While in the case of robberies, estimates of the impact of unemployment appear to be similar in both models. Auto theft is not consistent across all models. However, they may reflect a change in the demand for cars over time, which correlates with the number of cars on the road and thus with the potential supply of auto theft. Regarding drug crime, the estimates are similar in only 2 of the 4 models. The inclusion of fixed time effects significantly changes the nature of the estimated coefficients. The signs in the individual estimates do not change their character, except for model (3) and (4). Estimates of the impact of the lagged unemployment rate also show some inconsistency.

Table 4: OLS Regressions (Abbreviated models – Contemporaneous unemployment rate)

	(1)		(2)		(3)		(4)	
Dep. variable	Constant	U	Constant	U	Constant	U	Constant	U
Murder	9.833***	0.209***	5.491***	0.571***	14.034***	0.283*	18.901***	0.300*
	(1.056)	(0.075)	(1.123)	(0.094)	(3.153)	(0.144)	(3.021)	(0.128)
Rape	10.630***	0.587***	11.494***	0.515***	16.648***	0.407	25.706***	0.328
	(1.066)	(0.089)	(1.339)	(0.112)	(4.357)	(0.334)	(4.402)	(0.365)
Assault[A]	165.692***	15.825***	140.439***	17.931***	424.700***	5.161	475.308***	5.757
	(16.696)	(1.243)	(25.269)	(2.107)	(62.811)	(4.504)	(89.980)	(5.060)
Robbery	122.492***	1.778	75.552***	5.692***	213.235**	-5.339	304.866***	-7.427*
	(18.029)	(1.228)	(14.550)	(1.213)	(79.341)	(5.904)	(65.064)	(3.461)
Burglary	1,090.199***	80.971***	233.911	152.377***	4,001.721***	-8.892	5,038.796***	-4.931
	(195.982)	(13.654)	(256.523)	(21.392)	(812.854)	(55.861)	(766.408)	(50.604)
Larceny	82.359***	-1.176***	72.852***	-0.383	93.809***	-1.465	109.568***	-1.775
	(3.929)	(0.253)	(3.216)	(0.268)	(18.244)	(1.314)	(19.429)	(1.096)
Auto theft	797.015***	-23.715***	243.646***	22.431***	1,923.506**	-81.232*	2,438.621***	-83.129**
	(110.791)	(6.575)	(27.223)	(2.270)	(588.238)	(40.492)	(674.692)	(27.569)
Drugs	424.395***	-19.492***	281.689***	-7.592**	128.877***	-2.012	346.127***	-6.398**
	(45.802)	(2.809)	(28.701)	(2.393)	(18.931)	(1.214)	(98.897)	(2.567)
Observations	184		184		184		184	
Fixed effects	NO		YES		YES		YES	
Time effects	NO		NO		YES		YES	
Fixed x Time	NO		NO		NO		YES	
Robust standard errors in parentheses. A – Aggravated assault *** 99 % statistical significance; ** 95 % statistical significance; * 90 % statistical significance								

Source: *own calculations*

Table 5: OLS Regressions (Abbreviated model – Lagged unemployment rate)

	(1)		(2)		(3)		(4)	
Dep. variable	Constant	U(t-1)	Constant	U(t-1)	Constant	U(t-1)	Constant	U(t-1)
Murder	9.842***	0.184**	5.087***	0.570***	13.316***	0.209	13.397**	0.271*
	(1.075)	(0.078)	(1.171)	(0.095)	(2.222)	(0.158)	(4.997)	(0.133)
Rape	9.959***	0.612***	10.184***	0.593***	13.669**	0.425	21.056	0.294
	(1.170)	(0.098)	(1.801)	(0.146)	(5.640)	(0.414)	(12.966)	(0.475)
Assault[A]	159.734***	15.397***	121.422***	18.507***	461.052***	3.059	485.154***	3.498
	(17.582)	(1.295)	(25.689)	(2.085)	(67.708)	(4.696)	(70.081)	(5.233)
Robbery	120.967***	1.839	63.928**	6.469***	223.228**	-5.788	254.884***	-7.739
	(19.592)	(1.364)	(18.566)	(1.507)	(81.868)	(6.672)	(52.612)	(4.315)
Burglary	1,079.932***	72.883***	141.049	149.085***	3,373.081***	8.550	3,191.934***	13.875
	(204.073)	(14.288)	(294.513)	(23.903)	(749.646)	(58.433)	(799.516)	(61.692)
Larceny	84.145***	-1.318***	74.924***	-0.569*	88.170***	-1.709	101.455***	-1.958
	(4.253)	(0.273)	(3.345)	(0.271)	(20.229)	(1.575)	(25.145)	(1.434)
Auto theft	819.880***	-26.474***	240.329***	20.564***	1,905.717**	-76.327	1,848.759**	-76.332**
	(115.645)	(6.854)	(21.539)	(1.748)	(624.285)	(41.108)	(574.206)	(30.167)
Drugs	448.259***	-20.589***	302.773***	-8.781**	122.578**	-4.847*	128.683	-10.454**
	(49.362)	(3.028)	(34.235)	(2.779)	(36.954)	(2.416)	(78.920)	(3.664)
Observations	176		176		176		176	
Fixed effects	NO		YES		YES		YES	
Time effects	NO		NO		YES		YES	
Fixed x Time	NO		NO		NO		YES	
Robust standard errors in parentheses. A – Aggravated assault *** 99 % statistical significance; ** 95 % statistical significance; * 90 % statistical significance								

Source: *own calculation*

5. Conclusions

The issue of the relationship between crime and unemployment is an old well-known subject of research of many economists as well as other scientific disciplines. Nevertheless, economists over the last 50 years of research have not reached clear conclusions that would explain this relationship. We also do not expect a clear answer soon. In this contribution we tried to investigate the relationship between unemployment and crime in terms of the Slovak Republic.

The study uses panel data for all 8 regions of the Slovak Republic for the period 1997 - 2019 to clarify the issue. The results of our research suggest that unemployment in Slovakia does not have a statistically significant effect (or low) on the amount of observed crimes (rape, murder, aggravated assault, robbery, burglary, larceny, auto theft and crime connected with drugs). The expected assumptions of applying a motivational and opportunity theoretical view in estimating the effect of unemployment and the lagged unemployment on crime have hardly been found, or only to a very small extent. Exceptions are property crimes in the form of burglary and drug-related criminal offenses. These crimes had an opportunity effect, in which we expected negative effect of the unemployment rate. The burglary was the only one to meet expectations with a motivational effect, which was a positive sign in the estimates of the impact of the unemployment rate from the previous period. We should take into consideration that not all the estimated coefficients in the case of burglaries are statistically significantly different from zero. Looking at the aggravated assault, we found a statistically significant impact of unemployment in year t as well as t-1. The opportunity effect has not been confirmed, which we attribute to the potential increase in domestic violence due to frustration at losing a job or failing to find a new job. The motivational effect was confirmed in the model with the included fixed effects of the regions.

The presented results are not consistent with the studies dealing with this issue. Of course, it is not possible to exclude the possibility that the results are questionable because of incorrectly chosen statistical model or used methods. However, similar models and methods are used in other studies (Cantor and Land, 1985; Britt, 1994; Levitt, 2001). Our results, however, vary considerably.

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