UNDERSTANDING THE DETERMINANTS OF CRIMINAL BEHAVIOR IN POST-SOVIET AND POST-COMMUNIST COUNTRIES

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ABSTRACT

The dissolution of Soviet Union and collapse of the Communist system tremendously impacted the overall economic growth of post-Soviet and post-Communist. The breakup of the Soviet Union and burst-up of the Communist regime resulted in severe shocks to various institutions, such as economic, health care, educational, etc., making all countries vulnerable to unexpected economic and social fluctuations. It is a question of great importance how the above-mentioned countries managed their economic situation and what kind of social instabilities they struggled with. One of the possible issues that rose at that time is intentional homicide crimes. Nowadays, the data availability allows to make the analysis of dependent variables that could have influenced the level of intentional homicide crimes. In fact, the economics of crime is closely related to the economic and social factors. This thesis focuses mostly on economics variables and aims at finding the connection between the level of intentional homicide and unemployment rate, income inequality, inflation, and GDP per capita. To estimate the effect of a particular factor, the unbalanced panel of 496 observations within 26 countries in the period from 1991 to 2017 was used.

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Introduction

Collapse of the Soviet Union resulted in various structural changes in every post-Soviet and post-Communist country. Every country attempted to find an appropriate and efficient approach to resolve the raised difficulties in economic and social realms. Some countries could quickly catch up, the rest struggled more. Every taken decision impacted the well-being of the nation. However, the implemented policies could result in higher unemployment rate, inflation, income inequality, and even population dissatisfaction. All these factors can have direct or indirect influence on the level of intentional homicide crimes. Taking into account the fact that the post-Soviet and post-Communist countries shared similar environment for certain period of time, it is of high interest to analyze the differences in the level of intentional homicide crimes as well as the explanation of possibly involved reasons. In fact, there are many prominent scientists and remarkable papers discussing the relationship between homicides and unemployment rate, income inequality, inflation, poverty, education level, age structure, etc. However, most of the papers focus on a single city or particular country, mostly European or the United States. This paper differs in its variety of counties. It allows to examine and analyze particular factors not only within one country, but also compare the results and realize that, regardless the fact of sharing similar environment, considered countries have different sensitivity toward crime distribution. Moreover, the obtained results can be compared to analysis of other outstanding papers. Therefore, it allows to observe what factors are more significant for Europe, the United States, and post-Communist countries. The curious point is that the same macroeconomic or socioeconomic variable can have diverse influence over the countries. The different consequences could be attributed to various excluding variables, such as level of life satisfaction, alcohol consumption, police efficiency, and even weather conditions.

The empirical part of this paper includes the country-level data to identify the effects of frequently occurring factors on the level of homicide for the period from 1991 till 2017. The choice of post-Soviet and post-Communist countries might be of particular interest due to their similar past and different future. The collapse of the system obliged the counties to choose particular direction in further development. The decisions led to diverse number of criminal activities on the post-Soviet and post-Communist area. Due to the vulnerable governmental position, unstable economic and social situation, and the absence of state control, many countries were flooded with criminal activities in the beginning of 1990s. Especially, this tendency was common in Commonwealth of Independent States, where the power was shifted to gangsters. However, with time the extreme situation was overcome and, starting from 2000, the intentional homicide rate decreases.

Nowadays, Azerbaijan, Czech Republic, Hungary, Romania, Serbia, Slovakia, Slovenia represent the countries with low level of crimes, while Belarus, Kazakhstan, Mongolia, Russia, Ukraine have the opposite situation. All these differences could be explained by various factors, including culture difference, environmental conditions, political and social changes, life satisfaction, and even number of sunny days. Interesting example is North Macedonia that has a high unemployment rate since 1991, while the intentional homicides level stays low.

Thus, the paper analyzes the vast array of data gathered in unbalanced panel of 496 observations within 26 countries. The number of observations varies, depending on the number of macroeconomic variables included. The main purpose of the paper is to provide the results of multiple regression analysis and explain the effect of variables such as unemployment rate, income inequality, inflation, and GDP per capita on intentional homicide rate.

The paper is organized as follows. Chapter 2 presents the literature review, discussing the theoretical and empirical findings of the prominent economists, who made an enormous contribution in economics of crime. Chapter 3 and Chapter 4 reflects the data description and methodology used. Chapter 5 provides the results of the estimations. And, finally, Chapter 6 concludes the paper.

Chapter 1 – Literature review

According to the various papers, the main reasons of homicide crimes are still close related to the phycological problems, mental issues, family troubles, and bad attitudes. However, during the ninetieth century, mankind began to differentiate the gravity of the crimes, the severity of the corresponding punishment, and, more importantly, the hidden motives behind such actions (Becker, G. S., 1968). Eventually, in the end of the twentieth century, the economists tried to identify and understand the determinants from the socio-economic and demographic sides (Igbinedion, S. O., & Ebomoyi, I., 2017). It turned out that behind many criminal decisions there is a cost-benefit analysis and economic choice. In "Crime and Punishment: An Economic Approach" paper written by Gary S. Becker, the author emphasizes the attention to the importance of the economic model framework. The decision of committing crime heavily depends on variety of factors and consequences such as the probability of being caught, duration of the jail sentence, number of the policemen in the city (İmrohoroĝlu, A., Merlo, A., & Rupert, P., 2006). Becker (1968) is one of the first prominent scientists, who investigated in this realm, and made an enormous contribution by introducing his findings and theory. The author describes the behavioral model between the core elements, such as "number of crimes" and "cost of offences", "number of offenses" and "punishment", "number of offenses" and "expenditures on police and court", "number of convictions" and "cost of imprisonments", and "number of offenses" and "private expenditures on protection" (Becker, G. S., 1968, p. 172). The analysis of their interaction demonstrates that the illegal activities contribute to the diseconomies through damage to society and marginal harm (Becker, G. S., 1968, p. 173). For instance, Becker (1968) considers the offender as a rational person, who desires to maximize his profit with limited resources. The economist introduces the optimal decisions that explain the behavior of criminals, but also develop the most effective ways to deter crime. The wise and optimal allocation of resources can contribute to the reduction of incentives to commit crime and actual number of crimes. An individual is inclined to commit a crime if the expected utility of crime exceeds the utility of another occupation, meaning that benefits from crime exceeds the cost (Becker, G. S., 1968). The increase of probability of being caught as well as severity of the punishment can cause the reduction of incentives to commit a crime (Buonanno, P., 2003).

The consideration of macroeconomics problems as a possible trigger for criminal activities shed a light on different perspective of law enforcement policy planning. Under the influence of Becker's theory and growing tide of interest in the economic analysis of crime, other prominent economists tried to determine the fundamental macroeconomics factors that make a tangible impact on number of crimes. Most of the conducted research and published papers focus on the unemployment rate, income inequality, education level, inflation, and age structure.

Crime and Unemployment

Following up, Ehrlich (1973) in is work "Participation in illegitimate activities: A theoretical and empirical investigation" examines the relationship between income inequality, unemployment and number of crimes. The economist comes to a conclusion that there is a strong correlation between income distribution and number of crimes, while the interconnection with unemployment is less significant (Ehrlich, I., 1973). On a subconscious level, one can assume that there should be a strong correlation between unemployment and crime rate, since joblessness may provoke the individual to conduct imprudent actions. Edmark (2005) in his work "Unemployment and Crime: Is There a Connection?" studies the relationship between unemployment and crime in Swedish countries over the period from 1988 to 1999, which was significant by its vulnerability in labor market. The author comes to the conclusion that unemployment has a positive effect on some property crime, but it does not influence criminal actions toward individuals (Edmark, K., 2005). The study by Blackmore

(2003) takes South Africa for empirical analysis and finds the insignificant correlation between unemployment and common assault, while there is positive relationship between unemployment and property crime (Blackmore, F. L. E., 2003). However, the conducted study can be relevant and significant for this particular period of time and conditions. The connection of unemployment and level of crime is still ambiguous. The empirical analysis in the work "Understanding the Determinants of Crime" proves the poor dependency between these two variables. It turns out that the engagement in crime activities does not depend on employment. The paper states that 79% of criminals are employed, while only 21% are jobless (İmrohoroĝlu, A., Merlo, A., & Rupert, P., 2006, p. 279). Pridemore (2002) on the example of post-Soviet Russia proves that among 89 Russian regions the unemployment-crime relationship is negative, meaning that increase of unemployment rate results in decrease in level of crime. Logically, the possible explanation of this dependency can be the large number of policemen, severe punishment, or even people become more cautious. However, the unemployment-crime relationship can be discussed in both directions as well as unemployment can indirectly influence on level of crime. For instance, unemployment can lead to reduction of alcohol or drug consumption, which in its turn are one of the triggers for imprudent actions. Thus, the negative dependency of unemployment-crime relationship can be explained. Another assumption is that crime can influence the unemployment rate, implying that higher level of crime leads to higher unemployment rate. Thus, for people in regions with high level of criminal activity it is hard to open small/medium businesses and provide residents with work, or for people with criminal history it is hard to redeem themselves and find legal job. Based on the abovementioned papers and thinking, one cannot help but notice that the unemploymentcrime relationship is ambiguous and represents a weak dependency on each other. Nonetheless, one cannot refuse that this connection exists and increased opportunities of legal activities can be deterrent to criminal activities.

Crime and Income Inequality

Ehrlich (1973) addresses the relationship between level of crime and income inequality and tests it across states in the United States. The author finds that at the same period of time the increase in income inequality was accompanied by increase in a crime rate (Ehrlich, I., 1973). Reflecting the results, one can assume that there should be a strong correlation between these two variables since higher gap between poor and rich can definitely result in unsatisfactory living standards and enhancement of criminal activities. Reasons behind it can be various, ranging from struggle for existence to simple sense of injustice. Zhang (1997) in his study tries to understand the connection between welfare programs (provide financial support for poor individuals) and criminal activities. The author uses Gini index as a measure of income inequality. Zhang (1997) discovers positive and significant relationship between income, Gini index and crime rate. Later, Kelly (2000) also dedicates his study to the influence of inequality on criminal rate in 849 regions across the United States in 1994. The economist reveals the positive effect on the criminal activities, especially on violence (Kelly, M., 2000). The author claims the strong linkage between inequality and violence, while robbery is influenced by poverty rate and police activity (Kelly, M., 2000). Fajnzylber, Lederman, and Loayza (2002) investigates the correlation between Gini index and homicide and robbery rates across 39 countries. The authors run various type of models, taking into account endogeneity and measurement errors. The results correspond to the one discovered by Kelly (2000) and demonstrate that income inequality encourages violence (Fajnzylber, P., Lederman, D., & Loayza, N., 2002). Lobont, Nicolescu, Moldovan, and Kuloğlu (2017) try to identify the socioeconomic factors that influence the individual's decision of committing crime in Romania. The authors take into consideration the most frequently used variables, such as unemployment rate, inequality, inflation, education, etc. in the period from 1990 to 2014. The empirical evidence shows that the most influential variable is income inequality; however, the place of residence is of high importance, since rural people are more vulnerable compared to those in the agglomeration (Lobonţ, O. R., Nicolescu, A. C., Moldovan, N. C., & Kuloğlu, A., 2017).

In view of aforementioned, one can estimate the importance of nation's welfare and living standards, which can be measured through income inequality. The logic behind is trivial, the poorer the individual, the higher needs for survival, therefore, the stronger temptation to commit a crime.

Crime and Education

Based on the general understanding, education should occupy essential place in the discussion of determinants of criminal behavior. Individual with poor education background tends to be more susceptible to commit a crime, and usually such person comes from vulnerable areas with high level of poverty. Lochner and Moretti (2004) attempt to test the potential effect of education on the level of crime. The issue is to measure the benefits from education not only from private perspective, but also from social return (Lochner, L., & Moretti, E., 2004). At least education should train a person in patience, risk aversion ([Becker and Mulligan, 1997, cited in Lochner, L., & Moretti, E., 2004]), and phycological barrier to commit a crime and cause harm. In addition, education allows to enhance the level of knowledge as well as develop necessary skills to obtain high-paying jobs and be more competitive on the labor market. The findings display that education significantly decline the level of crime activity, and moreover, schooling causes larger social return than private return (Lochner, L., & Moretti, E., 2004). Another study by Lochner (2004) is "Education, Work, and Crime: A Human Capital Approach", where the author confirms that education diminishes predisposition to criminal activities. However, people with uncompleted higher education are likely to be involved in criminal activities and be arrested within 5 years after expulsion from school (Lochner, L.,

2004). Another remarkable work related to education and crime relationship was made by Usher (1997), who addresses the connection from another point of view. The author considers school as a transition period for young individuals, where the formation of morals and norms takes place (Usher, D., 1997). Usher (1997) ensures that education contributes to good virtue, teaches people to value hard work and dedication, to obey the law, to make a right choice guided by a sense of social benefit and common norms. Thus, one cannot help but notice the importance of education, since it can influence individual perception of good and bad. Good education can help people to be a good citizen and prefer legal activity and clear conscience rather to harm the society and commit a crime.

Crime and Inflation

Inflation-crime relationship has been raised in many distinguished papers that prove significant and positive correlation between these two variables. According to Rosenfeld (2014) inflation has substantial effect on crime rate. In the analysis, the author covers 30-years period from 1980 to 2010 years in 13 European countries and the United States and claims that inflation has more impact on homicide than unemployment and economic growth (Rosenfeld, R., 2014). Rosenfeld (2014) observes that inflation and crime share the similar behavior, for example, during the financial recession of 2008/2009, the inflation rate fell, so did the crime rate. Overall, the investigation reveals the same inflation-crime performance between 1982 and 2010 (Rosenfeld, R., 2014). The paper emphasizes stronger correlation between inflation and crime, rather unemployment and crime. Tang and Lean (2007) in their work "Will Inflation Increase Crime Rate? New Evidence from Bounds and Modified Wald Tests" questions the relationship between crime rate, unemployment, and inflation across the United Stated in the period of 1960-2005. Their findings confirm positive correlation of inflation-crime relationship in a long and short run along with dependency of criminal activity on inflation (Tang, C. F., and Lean, H. H., 2007). Moreover, the authors explain that with time inflation harms the level

of living, life satisfaction and purchasing power, which leads to engagement in criminal activities (Tang, C. F., and Lean, H. H., 2007). Tamayo, Chavez, and Nabe (2013) on the example of Philippines over the period of 2003-2007 support the positive relationship between inflation rate and criminal activities, noticing the synchronization of two variables over time. Devine, Sheley, and Smith (1988) scrutinize the effect of macroeconomic variables, namely unemployment and inflation, and social control variables – prison population rate and relief on criminal activity in the United States over the period of 1948-1985. The results demonstrate that homicide is under significant influence of inflation, rather than unemployment rate (Devine, J. A., Sheley, J. F., and Smith, M. D., 1988). However, the authors suggest to include both inflation and unemployment variables while analyzing criminal activities (Bunge, V. P., Johnson, H., and Baldé, T. A., 2005). In addition, the incarceration has a remarkable effect on homicide rate (Devine, J. A., Sheley, J. F., and Smith, M. D., 1988). The authors argue that inflation drastically harms low wage workers, making them more vulnerable to criminal activities, such as robbery; and makes government arrangement weak and unconfident (Devine, J. A., Sheley, J. F., and Smith, M. D., 1988). Cheong and Wu (2013), examining the determinants of criminal behavior in China, come to the conclusion that inflation plays a significant role in changes in criminal activity rate. The authors mention that poor people are more susceptible to criminal activities, since they have less accumulated wealth to overcome crisis and they suffer more from the inflation (Cheong, T. S., and Wu, Y., 2013). Mentioned papers focus their attention on the significant and positive relationship between inflation and crime rate, while confirming the ambiguity of unemployment and criminal activity relationship.

Crime and Other Factors

In addition to the discussed variables, there are numerous other factors that can directly or indirectly influence crime rate. The recent paper "Crime and subjective well-being in the countries of the former Soviet Union", published in *BMC Public Health*, discusses the correlation of the subjective well-being and the level of crimes in nine former Soviet Union countries. The findings reveal the higher dependency between the level of life satisfaction and crimes, rather than happiness and crimes (Stickley, A., Koyanagi, A., Roberts, B., Goryakin, Y., & McKee, M., 2015). These findings provoke the investigation of the elements that contribute to the level of life satisfaction. Based on the common perception, life satisfaction includes such important factors as political, social, economic environment of the home country, family/friends' relationships, health condition, finance/work/career possibilities and satisfaction. The list of factors can include more elements; however, from the socioeconomic point of view there are several factors that can be part of people's life satisfaction. Earlier, in 2012 Lysova, Shchitov and Pridemore (2012) published their paper "Homicide in Russia, Ukraine, and Belarus" in Handbook of European homicide research. The authors focus on Russia, Ukraine, and Belarus, emphasizing that these three countries were subjected to the economic, social, and political turmoil after collapse of the Soviet Union. Since more data became available, the authors try to consider the changes in homicide rate from another perspective, taking into account such variables as family and social structure, alcohol consumption, and historical evidences and determine what factors make these countries have higher homicide rates than Europe and the United States (Lysova, A. V., Shchitov, N. G., & Pridemore, W. A., 2012). In support of their assumption, the authors rely on Pridemore and coauthors works, where the latter proves the impact of alcohol consumption and social structure on the level of homicide. Pridemore and Kim (2007), inspired by the transition period after collapse of the Soviet Union, decide to examine the change in the number of interpersonal violence in case of negative socioeconomic and political changes. The results demonstrate the positive and significant relationship between negative changes and homicide rate (Pridemore, W. A., & Kim, S. W., 2007). Markowitz (2000) in her study examines the relationship between price of alcoholic beverage and the criminal violence, namely, "robbery, assault, and sexual assault", in 16 countries in the period 1989-1992 (Markowitz, S., 2000, p. i). The author demonstrates that the increase of price of alcohol can cut the incidence of criminal violence; thus, confirming the correlation between alcohol consumption and criminal rate. In the study "Structural Determinants of Homicide: The Big Three" by Maria Tcherni, the author claims that criminal violence is influenced by three major determinants, specifically, family and social structure, low education and poverty, and racial composition (Tcherni, M., 2011). The abovementioned studies corroborate the interconnection of crime rate and individual social interactions, emphasizing that the latter can shape major socioeconomic variables.

Chapter 2 – Data Description

The paper examines the relationship between intentional homicide rate and some of the selected socioeconomic variables. The unbalanced panel consists of 496 observations within 26 post-Soviet and post-Communist countries in the period between 1991 and 2017 years. Post-Soviet countries include Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. Post-Communist countries include Albania, Bulgaria, Czech Republic, Hungary, Mongolia, North Macedonia, Poland, Romania, Serbia, Slovakia, and Slovenia. Angola, Afghanistan, Benin, Bosnia and Herzegovina, Cambodia, Croatia, Dem Rep. of Congo, Ethiopia, Eritrea, Germany (East), Montenegro, Mozambique. Somalia, and Yemen are not considered in this paper either due to the lack of available data or successive wars. The data was sourced from World Bank Open Data. The table below reflects the summary statistics of considered variables:

	Observations	Mean	Std. Dev.	Min	Max
Intentional Homicides	496	5.374432	5.055028	.4816398	49.87222
Gini Index	576	32.26858	4.911573	23.7	48.4
Educational attainment	401	96.11501	5.749372	74.8313	100
Inflation (lg)	643	2.420821	1.836778	-6.700712	9.645
Unemployment	702	10.45871	6.310088	.6	37.25
GDP per capita, PPP (lg)	677	9.133814	.8008291	6.953782	10.39117

Table 1: Summary statistics

Intentional homicides: number of violence, measured per 100 000 people. Killing in armed conflicts is excluded. According to the data, the highest score starting from 2000 year was detected in Russian Federation. This anomie can be explained by high level of alcohol

consumption, educational attainment, poverty, social and family disorganization (Lysova, A. V., Shchitov, N. G., & Pridemore, W. A.,2012).

Gini Index (measurement of inequality): Gini coefficient measures the wealth distribution among population. It ranges from 0 to 100, indicating perfect equality and perfect inequality, respectively. Since Gini coefficient moves extremely slowly, missing data was replaced by the latest available measurement for all countries. Gini index is expected to be positively related to the crime rate, meaning the higher inequality, the higher homicide rate. Based on the obtained data, Russian Federation demonstrates high inequality gap as well as high intentional homicide rate.

Educational attainment (25 years and over): percentage of the population, who completed primary education. Due to Communist system, overall population tends to receive the good primary education; thus, education attainment is significantly high (the lowest was detected in Serbia in 2002 – 74.8313%). Since the educational attainment is not subject to dramatic changes, missing data was replaced by the latest defined measurement. Education is expected to be negatively related to the crime rate.

Unemployment: macroeconomic variable that indicates part of the labor force without work, but seeking for the job. Based on the literature review, this indicator is considered to be ambiguous. Unemployment rate is expected to be positively related to homicide rate. However, data shows an interesting example – North Macedonia that, regardless of high unemployment rate (\sim 30%), has remarkably low level of intentional homicide (\sim 2).

Inflation: measures the rate of price change in the economy. Inflation is expected to be positively related to the level of crime, since it causes economic vulnerability and changes in preferences. Moreover, inflation influences criminal rate progressively, because it takes time to realize the effect of inflation (if it is not hyperinflation) and diminish the purchasing power.

Based on the literature review, inflation and unemployment indicators should be included together in the data analysis, since these variables shape the macroeconomic environment. To make data closer to normal distribution and more interpretable, the data was a subject to log transformation.

GDP per capita, PPP: converted to the 2011 international dollar. This variable can be interpreted as an opportunity cost of crime. The highest GDP per capita in recent years was indicated in Slovenia and Czech Republic, where the homicide rate is also happened to be low. GDP per capita is expected to have negative relationship with crime rate. To make data closer to normal distribution and more interpretable, the data was a subject to log transformation.

	Intentional Homicides	Gini Index	Educational attainment	Inflation (lg)	Unemployment	GDP per capita, PPP (lg)
Intentional	1.0000					
Homicides						
Gini Index	0.3475*	1.0000				
Educational attainment	0.0789	-0.1045*	1.0000			
Inflation (lg)	0.2927*	0.1039*	-0.1258*	1.0000		
Unemployment	-0.0731	0.0852*	-0.6273*	-0.2030*	1.0000	
GDP per capita, PPP (lg)	-0.1973*	-0.2077*	0.1448*	-0.4468*	-0.0492	1.0000

*Table 2: Correlation matrix Note: * statistically significant at p<.05*

The correlation matrix table proves most of the expectations. There are positive relationships between Gini index (~35%), inflation (~30%) and intentional homicide rate. Unemployment (~7%) and GDP per capita (~20%) are negatively related to intentional homicide. Regardless that unemployment-homicide correlation should be positive, the negative result can be justified by differences between countries. For instance, the explanation of high unemployment rate and low intentional homicide in North Macedonia could be the ratio of old and young people. According to PopulationPyramid.net, the number of young people decreases

every year. This fact could be the reason for low intentional homicide level, since young people are more suspensive to commit a crime (Foot, D. K., and Stoffman, D., 1998). The correlation between education and intentional homicide does not satisfy the expectation. Since most of the papers reveal the strong dependence between these two variables, the reason in this case can be lack of data. Thus, education variable is excluded from empirical analysis in order to avoid inaccurate results. All correlation by themselves cannot be fully conclusive, because there could be many other variables and factors that drive the difference in homicide levels across countries. This fact shows that the model with time and country fixed effect needs to be implemented.

Chapter 3 – Methodology

Taking into account the literature review and the Pearson correlation coefficients from data description, unemployment, Gini index, inflation, and GDP per capita variables are included into the econometric model. Unbalanced panel data set contains 496 observations and includes both cross-section and time series data, that makes panel data set plentiful. It allows to evaluate more complicated models and define their behavior pattern. This feature contributes to more effective estimates. The multiple regression analysis is chosen to determine the dependency between intentional homicide and the above-mentioned variables. The model helps to explain the theoretical observations and assumption as well as forecast the further direction and suggest recommendations (Jeon, J., 2015). Below, the empirical regression equation is estimated, which can be represented as:

Homicide_{i,t} = α + β_u Unemployment_{i,t} + β_{gini} Gini_{i,t} + β_{inf} (lnInflation_{i,t}) + β_{gdp} (lnGDP_{i,t}) + $f_{i,t}$ + f_t + $\varepsilon_{i,t}$, where

i - country, t - time

homicide_{i,t} – dependent variable, homicide rate per 100 000 people

 $unemployment_{i,t}-unemployment\ rate$

 $gini_{i,t}$ – Gini Index that measures inequality by income distribution

lninflation_{i,t}-log-transformed inflation rate

lnGDP_{i,t} – log-transformed GDP per capita, PPP

 f_i – country fixed effect, f_t – time fixed effect

 $\epsilon_{i,t}$ – error term.

Every economic unit, in this particular case either country or year, is treated as unique with its specific characteristics and occasions. Thus, expecting that explanatory variables should have the similar effect on intentional homicide rate regardless country and time, country- and time-fixed effect is implemented in the model. Fixed effect allows to avoid biases or any external impacts that can change the outcome variables and control the specific unobserved effects. These configurations allow to adjust the model for individual differences.

Chapter 4 – Empirical Findings

This chapter provides the results of multiple regression analysis within 26 countries in the period from 1991 to 2017. The table below reveals the variable, which has a strong effect on intentional homicide rate. New variable, GPD growth, was added in analysis and calculated manually. This analysis was conducted in a way of considering every variable separately. The outcome is that unemployment rate is statistically significant, while inflation, GDP growth, Gini index, and GDP per capita do not have substantial influence on intentional homicide. According to the findings, increase of unemployment rate by 1 percentage point will result in 2.7 increase in intentional homicide rate. Regardless the fact that the rest of the variables are not statistically significant, their behavior is in accordance with paper's expectations and previously discussed works. The descriptive statistics shows that ~73% of data can be explained by the multiple regression analysis.

	Intentional Homicide							
Unemployment rate	0.145**							
	(0.06)							
Inflation		0.020						
		(0.10)						
GDP growth			-9.156					
			(8.11)					
Gini Index				-0.017				
				(0.10)				
GDP per capita					-4.518			
					(3.18)			
Country FE	yes	yes	yes	yes	yes			
Time FE	yes	yes	yes	yes	yes			
N	496.000	473.000	491.000	457.000	496.000			
R ²	0.739	0.732	0.738	0.733	0.743			

Table 3: Intentional homicide estimation results Note: ** statistically significant at p<.05

As stated in literature review, Bunge et al. (2005) suggests to include both unemployment rate and inflation while analyzing the criminal activity. Following the advice, Table 4 reflects the results of unemployment rate and other variables combination. The last column demonstrates the relationship between all variables. One cannot help but notice that unemployment rate variable still displays statistically significant results, while other variables remain insignificant. However, their behavior satisfies the assumptions of this paper.

			Intention	al Homicide		
Unemployment rate	0.145**	0.153**	0.116*	0.169**	0.107	0.095
	(0.06)	(0.07)	(0.06)	(0.08)	(0.09)	(0.10)
Inflation		0.074				0.083
		(0.10)				(0.11)
GDP growth			-7.796			-7.825
			(8.26)			(11.73)
Gini Index				-0.021		-0.036
				(0.09)		(0.10)
GDP per capita					-3.938	-5.501
					(3.15)	(4.00)
Country FE	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes
Ν	496.000	473.000	491.000	457.000	496.000	496.000
\mathbb{R}^2	0.739	0.737	0.741	0.739	0.746	0.739

Table 4: Intentional homicide estimation results (unemployment + other factors)Note: * statistically significant at p < .10, ** statistically significant at p < .05,

Table 5 introduces several countries with statistically significant results. The full table with the estimates for all fixed effects can be found in Appendix. As was discussed in previous chapters, North Macedonia is an exceptional example with high unemployment rate and low intentional homicide. The analysis shows that there is a negative correlation between unemployment and criminal activity, meaning that if unemployment rate increases, intentional homicide will decrease. This outcome is not in accordance with paper's expectations, and even country- and time-fixed effect could not fully control unobservable effects. One of them could be the changes in population age structure.

	Intentional Homicide						
	Unemployment rate	Inflation	GDP growth	Gini Index	GDP per capita	Summary	
North Macedonia	-7.949***	-5.700***	-5.855***	-4.495***	-4.348***	-4.700*	
	(0.99)	(0.09)	(0.16)	(1.17)	(0.90)	(2.49)	
Russian Federation	14.269***	12.803***	12.761***	13.020***	17.177***	18.793***	
	(0.60)	(0.25)	(0.12)	(1.18)	(3.05)	(3.81)	
Ukraine	0.158	-1.150***	-1.323***	-1.175***	-1.360***	-1.358	
	(0.47)	(0.18)	(0.34)	(0.16)	(0.31)	(1.23)	
Country FE	yes	yes	yes	yes	yes	yes	
Time FE	yes	yes	yes	yes	yes	yes	

Table 5: Estimated fixed effects for select countries from the estimation in Table 3 Note: * statistically significant at p < .10, ** statistically significant at p < .05, *** statistically significant at p < .01

Russian Federation is among countries with high intentional homicide rate and it also has a high inequality index. The table above presents strong correlation between all factors and homicide rate. However, all variables have a positive correlation with criminal activities, that is unusual. Pridemore (2002) in his paper finds that unemployment rate is significantly and negatively related to intentional homicide, while current analysis demonstrates strong and significant positive dependency. Inequality-homicide relationship is inconsistent (Pridemore W.A., 2002), while here it is significant and positive. The explanation of this discrepancy could be the unobservable variables, such as alcohol consumption, poverty, unfavorable social and economic changes, single-parent households, which are among the main triggers in Pridemore (2002), Pridemore and Kim (2007), and Lysova et al. (2012) papers.

Pavlo (2011) in his work "Distribution of Crime Across Ukraine: Panel and Spatial Analysis" presents the results of his regression analysis, claiming that there is a weak and insignificant dependency of crime on unemployment rate, inequality, and growth. While current analysis shows the strong dependency of crime on inequality and growth. The author emphasizes the importance of poverty level and education attainment. Among socioeconomic variables, the author highlights police efficiency, moral aspects, and concentration of the population in urban areas (Pavlo, I., 2011).

In the light of the above discussion, one is able to conclude once again that in case of post-Soviet and post-Communist countries the unemployment rate plays a significant role. While considering country by country, it is extremely difficult to determine what factor has the strong influence on intentional homicide rate, since there are plenty of unobservable variables and facts that can directly or indirectly impact the final outcomes.

Chapter 5 - Conclusion

The unbalanced panel data analysis within 26 countries in the period from 1991 to 2017 allows to determine the dependency between intentional homicide rate and socioeconomic and macroeconomic variables, such as unemployment rate, inequality, GDP per capita, GDP growth, and inflation. The analysis reveals that unemployment has a statistically significant influence on intentional homicide rate in post-Soviet and post-Communist countries, while other mentioned variables are not significant. According to the findings, increase of unemployment rate by 1 percentage point will result in 2.7 increase in intentional homicide rate. Regardless the fact that the rest of the variables are not statistically significant, their behavior is in accordance with paper's expectations and previously discussed works. Despite the fact of sharing similar environment, every country and time remains unique and demonstrates different reaction on the same variables. This evidence can be explained by the existence of unobservable factors, country specification, social and economic situation, life satisfaction, family structure, and many other factors that one cannot even think. In view of abovementioned findings and literature review, the policy recommendations can be concluded. Since unemployment rate plays a significant role, the policy should focus on deceasing rate of this variable and simultaneously take care of inflation rate, because these two variables work in pair. As per analysis other variables are not significant, one can rely on the literature review and concentrate more on socioeconomic variables, namely, education, policy efficiency, family structure, life satisfaction, etc. It is of high importance to enhance educational attainment, hence inculcating the moral aspects and notion of being a good citizen. Regardless the fact that macroeconomic variables can be significant in understanding the criminal behavior, the first step to reduce the intentional homicide rate is to follow social norms and moral aspects.

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Appendix

Table A1: Multiple regression analysis (estimated fixed effects) *Note:* * statistically significant at p<.10, ** statistically significant at p<.05, *** statistically significant at p<.01

	Intentional Homicide					
Unemployment rate	0.145**					0.095
	(0.06)					(0.10)
Inflation		0.020				0.083
CDP growth		(0.10)	0.156			(0.11)
GDI giowii			(8 11)			(11.73)
Gini Index			(0.11)	-0.017		-0.036
				(0.10)		(0.10)
GDP per capita					-4.518	-5.501
					(3.18)	(4.00)
	4 5 4 9 4 4 4		4.000 to bet			
Armenia	-4.643***	-5.168***	-4.983***	-4.706***	-6.976***	-6.323***
	(0.18)	(0.06)	(0.09)	(0.46)	(1.33)	(1.27)
Azerbaijan	-3.707***	-5.368***	-4.797***	-5.154***	-4.035***	-3.452***
	(0.58)	(0.20)	(0.36)	(0.18)	(0.78)	(1.04)
Belarus	0.272	-0.826***	-0.641***	-0.732***	1.178	2.150
	(0.37)	(0.26)	(0.07)	(0.13)	(1.27)	(1.63)
Bulgaria	-4.195***	-5.104***	-5.065***	-4.966***	-2.576	-2.004
	(0.28)	(0.07)	(0.15)	(0.41)	(1.62)	(1.89)
Czech Republic	-5.134***	-6.729***	-6.819***	-6.824***	-1.035	0.599
	(0.60)	(0.09)	(0.21)	(0.30)	(3.91)	(4.24)
Estonia	1.438***	-0.010	0.024	0.403	5.091	6.247
	(0.39)	(0.05)	(0.11)	(0.62)	(3.24)	(3.98)
Georgia	-2.168***	-2.842***	-2.487***	-2.664***	-4.345***	-4.396**
	(0.19)	(0.11)	(0.13)	(0.87)	(1.25)	(1.62)
Hungary	-4.624***	-5.977***	-6.070***	-6.021***	-1.147	0.149
	(0.50)	(0.06)	(0.21)	(0.05)	(3.30)	(3.60)
Kazakhstan	5.011***	3.719***	3.819***	3.650***	7.055***	8.160***
	(0.47)	(0.13)	(0.09)	(0.19)	(2.22)	(2.58)
Kyrgyz Republic	1.667***	0.331***	0.275	0.466	-4.460	-5.271
	(0.49)	(0.11)	(0.19)	(0.39)	(3.49)	(4.90)
Latvia	-0.692***	-1.298***	-1.352***	-1.255**	2.254	3.382
	(0.19)	(0.06)	(0.06)	(0.47)	(2.39)	(3.11)
Lithuania	1.511***	0.593***	0.717***	0.812	4.815*	6.043
	(0.25)	(0.09)	(0.02)	(0.56)	(2.76)	(3.61)
Moldova	0.632	-0.930***	-0.990***	-0.834*	-4.384	-4.733
	(0.57)	(0.13)	(0.22)	(0.47)	(2.58)	(3.86)
Mongolia	4.403***	2.797***	3.002***	2.945***	2.549***	3.274**
	(0.68)	(0.31)	(0.27)	(0.65)	(0.26)	(1.23)

North Macedonia	-7.949***	-5.700***	-5.855***	-4.495***	-4.348***	-4.700*
	(0.99)	(0.09)	(0.16)	(1.17)	(0.90)	(2.49)
Poland	-5.488***	-6.215***	-6.170***	-6.207***	-2.064	-0.997
	(0.25)	(0.04)	(0.08)	(0.36)	(2.83)	(3.42)
Romania	-4.201***	-5.756***	-5.727***	-5.726***	-2.485	-1.275
	(0.58)	(0.14)	(0.12)	(0.32)	(2.19)	(2.40)
Russian Federation	14.269***	12.803***	12.761***	13.020***	17.177***	18.793***
	(0.60)	(0.25)	(0.12)	(1.18)	(3.05)	(3.81)
Serbia	-5.652***	-5.594***	-5.608***	-5.346***	-3.910***	-4.136**
	(0.19)	(0.25)	(0.12)	(0.33)	(1.16)	(1.56)
Slovak Republic	-5.665***	-6.494***	-6.111***	-6.131***	-1.378	-0.984
	(0.14)	(0.09)	(0.10)	(0.29)	(3.26)	(3.85)
Slovenia	-5.368***	-6.849***	-6.969***	-6.954***	-1.085	0.456
	(0.56)	(0.06)	(0.24)	(0.25)	(3.98)	(4.34)
Tajikistan	-4.040***	-4.751***	-4.869***	-5.360***	-11.299**	-13.521**
	(0.24)	(0.25)	(0.33)	(0.35)	(4.79)	(6.04)
Turkmenistan	-2.195***	-3.415***	-3.533***	-3.282***	-3.658***	-3.322**
	(0.47)	(0.34)	(0.45)	(1.14)	(0.49)	(1.31)
Ukraine	0.158	-1.150***	-1.323***	-1.175***	-1.360***	-1.358
	(0.47)	(0.18)	(0.34)	(0.16)	(0.31)	(1.23)
Uzbekistan	-3.873***	-5.129***	-5.182***	-4.764***	-8.677***	-9.077**
	(0.46)	(0.29)	(0.34)	(0.80)	(2.72)	(3.75)
_Iyear_1995	4.534***	0.000	3.864***	0.751	0.000	-0.877
	(1.00)	(.)	(0.86)	(0.67)	(.)	(2.74)
_Iyear_1996	4.209***	0.589*	4.736***	0.000	0.002	-0.290
	(0.91)	(0.34)	(0.95)	(.)	(0.28)	(3.09)
_Iyear_1997	6.042**	2.340	6.531**	2.571	1.881	2.571
	(2.38)	(2.22)	(2.46)	(2.97)	(2.29)	(2.83)
_Iyear_1998	4.205***	0.580	4.829***	0.264	0.314	0.447
	(1.08)	(0.74)	(1.23)	(0.84)	(0.91)	(2.53)
_Iyear_1999	3.668***	0.181	4.268***	-0.172	-0.042	0.091
	(0.97)	(0.65)	(1.09)	(0.77)	(0.93)	(2.50)
_Iyear_2000	3.216***	-0.300	4.057***	-0.642	-0.342	-0.046
	(0.99)	(0.46)	(1.03)	(0.58)	(0.74)	(2.52)
_Iyear_2001	3.241***	-0.376	4.044***	-0.688	-0.107	0.230
	(1.04)	(0.53)	(1.11)	(0.64)	(0.95)	(2.31)
_Iyear_2002	3.082***	-0.541	3.847***	-0.964	-0.045	0.305
	(1.10)	(0.59)	(1.13)	(0.67)	(1.10)	(2.18)
_Iyear_2003	2.993***	-0.708	3.790***	-1.132*	0.090	0.576
	(1.04)	(0.56)	(1.09)	(0.62)	(1.20)	(1.97)
_Iyear_2004	2.522**	-1.175**	3.345***	-1.600**	-0.084	0.601
	(0.99)	(0.51)	(1.04)	(0.71)	(1.40)	(1.69)
_Iyear_2005	2.511**	-1.275**	3.255***	-1.686**	0.142	0.998
	(1.01)	(0.57)	(1.08)	(0.75)	(1.59)	(1.54)

_Iyear_2006	2.004**	-1.927***	2.681***	-2.372***	-0.139	0.909
	(0.79)	(0.46)	(0.89)	(0.71)	(1.76)	(1.22)
_Iyear_2007	1.808**	-2.284***	2.332**	-2.741***	-0.112	1.086
	(0.69)	(0.49)	(0.84)	(0.74)	(2.00)	(1.02)
_Iyear_2008	1.531**	-2.587***	1.732**	-3.041***	-0.185	0.781
	(0.59)	(0.49)	(0.65)	(0.72)	(2.14)	(0.86)
_Iyear_2009	0.826	-3.102***	0.414	-3.446***	-0.843	-0.959
	(0.51)	(0.59)	(0.77)	(0.77)	(2.04)	(1.57)
_Iyear_2010	1.251	-2.319**	1.739*	-2.896***	-0.086	0.626
	(1.00)	(0.84)	(0.98)	(0.99)	(2.22)	(1.22)
_Iyear_2011	0.864	-2.869***	1.447*	-3.370***	-0.422	0.271
	(0.74)	(0.64)	(0.78)	(0.84)	(2.28)	(0.84)
_Iyear_2012	0.473	-3.305***	0.725	-3.849***	-0.744	-0.210
	(0.66)	(0.67)	(0.66)	(0.84)	(2.31)	(0.85)
_Iyear_2013	-0.220	-4.100***	0.092	-4.594***	-1.333	-0.609
	(0.39)	(0.87)	(0.42)	(1.01)	(2.47)	(0.52)
_Iyear_2014	-0.180	-4.297***	0.013	-4.620***	-1.223	-0.733
	(0.43)	(0.85)	(0.45)	(0.98)	(2.55)	(0.45)
_Iyear_2015	-0.348	-4.409***	-0.206	-4.796***	-1.453	-0.664
	(0.38)	(1.02)	(0.38)	(1.15)	(2.61)	(0.47)
_Iyear_2016	0.000	-3.942***	0.000	-4.517***	-0.961	0.000
	(.)	(0.97)	(.)	(1.02)	(2.65)	(.)
_cons	3.262**	9.572***	5.671***	10.502***	48.290*	56.598
	(1.24)	(0.51)	(0.74)	(2.75)	(26.86)	(38.99)
Ν	496.000	473.000	491.000	457.000	496.000	436.000
\mathbf{R}^2	0.739	0.732	0.738	0.733	0.743	0.750