



Analyzing the Impact of Economic and Climate Factors on Crime in Iran¹

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Received: 03 November 2020, Revised: 21 January 2021, Accepted: 13 February 2021

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Abstract

Some evidence indicates the role of economic variables including unemployment and inflation in committing a crime. However, the researches regarding the role of climate factors on crime are a few. This paper is investigating the climate factors alongside economic ones influencing crime in Iran for the 1984-2020 period. We use the misery index, the combination of inflation and unemployment in this work. One of our hypotheses is that there is a significant relationship between the misery index and committing crimes in Iran. The results indicate that firstly, there are positive and significant relationships between the misery index and economic growth on one hand and the amount of crime on the other. Secondly, there is a positive and significant relationship between climate factors and the number of committed crimes.

Keywords: Crime, Climate Factors, Law and Economics, Economic Factors, Iran.

JEL Classification: D190, K140, K360.

Introduction

From a political economy perspective, there is a significant relationship between law and economics. Law and economics analysis can help policymakers to improve their developmental stages and to resolve their institutional shortcomings as well (Schaefer and Cooter, 2012). Crimes on one hand and bad laws on the other do have influential impact on economic progress. There are, however, different factors behind committing crimes; some are economic and some others are noneconomic in principle. Not surprisingly, Hayek a pioneer in law and economics believes that violent activities and crimes threaten the individual and social security, decline the social capital and especially endanger the trust in society. These outcomes eventually loosen the coherence of society (Anderson, 2001; Hsiang et al., 2013). Nevertheless, the amount of violence, offense, and other crimes are higher in regions closer to the equator (Walker et al., 1990). In addition, fluctuations in environmental elements, including water and weather status, can have a significant impact on crime within a specific year (Burke, 2015). Committing crime as an undesirable phenomenon is an effect of some economic, social and environmental causes. Diagnosis of roots and causes of crime would help policymakers to prevent and preempt the committing crime in the future. As the

1. The authors would like to appreciate Professor Hans-Bernd Schaefer, Professor of Law and Economics, Bakeries Law School, Germany, for his scientific comments.

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committing crimes and its punishment (including imprisoning the criminals), will impose a high cost on the public sector, diagnosis and preemption of crimes in question is an economically efficient effort. Iran, on one hand, economically speaking, suffers from double-digit inflation rate (above 30%), double-digit unemployment rate (above 12%), and consequently double-digit misery index (a combination of inflation and unemployment rate). On the other hand, Iran is located in a dry and hot area of the world (Dadgar et al., 2016). Although it is famous that Iran is a four-season country with four or more climate kinds, the temperature of some part of it is very high; the temperature will reach even to 50 Celsius. In sum, a major part of Iran is located in hot and warm regions. Another supporting reason for the warmness of Iran is the low annual raining in this country, which is 228 millimeters in ordinary years. Water sources in Iran are limited too. The warmer a region is, the angrier are its citizens, and anger itself is a potential source for committing crimes. This article is analyzing the relationship between economic variables and climate change in Iran on one hand and the committing crimes on the other. The paper is structured in the following framework: Section 2 details the Theoretical foundations and empirical studies. Section 3 presents the Model and analyzing the results, finally Section 4 provides the conclusions.

Theoretical Foundations and Empirical Studies

Different and diversified factors influence on committing crimes in different societies. These include economic, social, political, cultural, environmental and climatological factors. It is understood that economic conditions and economic elements are amongst the most influential factors behind the crime and criminal activities in different societies. The role of economic factors in committing crimes is so high and strong that it may even overshadow the impact of non-economic factors (Dadgar and Nazari, 2016). Becker (1968), a pioneer in studying the relationship between economics and criminal activities points out the subject under a simple cost-benefit analysis in economic terms. In other words, he describes the problem of crime under the ordinary supply-demand relationship in economic literature. According to Becker, supply and demand for criminal activities depend on individual cost and benefit of committing a crime in question. In this case, committing a crime is a kind of activity, which may enter, in the utility function of individual persons. According to this approach, if the expected utility of committing a crime is higher than its predicted costs, people will commit crimes. The higher the probability of arresting will increase the cost of committing a crime and hence would decline criminal activity too. Consequently, the higher the expected punishment for a crime, the more the expected cost and the lower the criminal activities. Recent studies in behavioral economics, however, question the mere simple cost-benefit relationship and indicate the impact of other factors too (Corr and Plagnol, 2019). Accordingly, one may add the potential and long run cost and benefit of committing a crime, moral considerations, risk-loving behavior, and so on as other factors influencing committing a crime. Although some behavioral economic studies (Thaler, 2017), have questioned the robustness of simple cost-benefit analysis, some others follow and reinforce the Becker findings (Sjoquist, 1973; Cooter and Ulen, 2016).

Another influential cause of committing crime among recent studies is the climate conditions. Firstly, Montesquieu (1749/1748) believed that climate differences shape human societies, and weather temperature does have significant impact on habits and traditions. Secondly considerable works indicate the significant relationship between crime and climate change on one hand and law of temperature on the other (Levitt, 2001; Pease, 2011; White, 2012; Hu, 2017). Alternatively, some studies indicate the significant relationship between offensive behavior on one hand and climate change on the other. As if to escape from the impact of hot weather, individual people commit to aggressive activities (Bell, 1992).

According to the Routine Activity Theory, RA, committing a crime requires accomplishments of three elements; attractive target, the suitable victim (along with a motivated offender), and the absence of efficient guardianship (Felson, 1987; Cohn and Rotton, 2000). Some studies indicate that climate change and hot weather will increase attractive targets (and suitable victims). Inefficient guardianship system will actually support the offenders too (Cronish and Clarke, 2000). The efficient guardianship system would increase the cost of committing a crime and, as a result, can decline the number of committed crimes, thus a strong and efficient public sector and guardianship are required. By providing efficient monitoring of the public sector, the cost of committing a crime would increase. Some studies prove that climate and environmental status would shape the life and change the culture in an invisible mode (Grabmeier, 2016). Recent studies maintain on CLASH model (Climate, Aggression and Self-control in Humans) which has demonstrated a significant relationship between the amount of committed crime on one hand and hot climate on the other (Van Lange, 2017). According to this model, hot weather bothers people, which may eventually stimulate them to commit violent activities. In addition, the CLASH model stresses climate conditions and not hotness alone. For instance, it emphasizes changing the climate as an influential factor for declining crime, identical climate (non-changing), however, as a potential factor for increasing crimes. According to the model in question, the people living in hot and non-changeable climate areas are not necessarily concerned about their future life style, because for them there is no essential difference between present, past, and future. Specifically speaking, these people are not sensitive to the importance of time itself. Hence, their decision is not time centered and plan oriented, rather, it is, momentary oriented and thus, they decide suddenly, and radically. One can expect appearance of some offensive behavior under conditions as such. Meanwhile, according to CLASH model, climate conditions and culture are intermingled in such a way that climate change influences on culture significantly. Some studies have been forecasting the impact of climate change on crime for 2100. They demonstrate that the impact of climate conditions on crime works without any lag too. They predict that between 2010 and 2099, climate change leads to 22000 murder, 1.2 million violence beating, and 2.2 million thefts, robbery and so on (Ranson, 2014). Of course, some other studies maintain the role of government policy to prevent committing crimes. The efficient public policies will decline some part of climate crime as well (White, 2014; Donovan, 2019).

Reviewing Empirical Studies

According to Field (1992), theft and robbery have a positive and significant relationship with climate temperature. Cohn and Rotton (2000) argue that there is a positive dependency between robbery and temperature degrees. Sadeghi et al. (2005) have indicated the positive relationship between unemployment and inequality on theft in Iran. Based on Jacob et al. (2007), 10-degree climate change in a week has led to a 3 percent reduction in criminal activities. Tang and Lean (2007) have indicated that there is a unilateral causality relationship between inflation and unemployment in the USA on one-hand and criminal activities on the other. They also proved that there is a positive relationship between inflation and unemployment in committing a crime, both in the short run and long run. According to Habibullah and Bahrom (2008), inflation and unemployment have a positive impact on criminal activities in Malaysia. Gill et al. (2009) showed that there is a long-run relationship between crime and criminal activities on one hand, and inflation, unemployment and poverty in Pakistan on the other. Tang and Lean (2009) proved that the impact of the misery index on criminal activities in the USA is significantly positive. Maddah (2011) has indicated a positive relationship between murder and theft on one hand and inequality on the other. Mehregan and Garshasbi (2012) have indicated the same result for Iran. Haddad-Keshavarz

and Markazi Moghadam (2011) have shown the influential impact of economic factors on crime in Iran. Saridakis and Spengler (2012) indicated that unemployment has increased crime in Greece.

Neanidis and Papadopoulou (2013) have shown a negative relationship between crime and economic growth. Kumar (2013) has proven a negative relationship between theft and murder on one hand and economic growth on the other in India. Dadgar and Nazari (2013) have proven that the misery index does have a positive relationship with a crime in both the short and long run. Fallahi and Rodríguez (2014) have indicated the positive and significant impact of unemployment on crime in the USA. By investigating 2997 cities in the USA, Ranson (2014) proved the positive relationship between weather temperature and crime in that country. Enamorado et al. (2014) indicated that drug crimes have had a negative impact on economic growth in Mexico. Khan et al. (2015) have shown the positive impact of the unemployment rate and GDP per capita on crime in Pakistan. Dadgar and Nazari (2016) have proven that both economic growth and misery index have a positive impact on crime in Iran. Lobonț et al. (2017) have demonstrated the positive relationship between income inequality and crime in Romania. Schinasi and Hamra (2017) have indicated that hot weather has had a positive impact on crime in Philadelphia. Coccia (2017) has demonstrated the positive relationship between social and economic inequality on one hand, and violent crime on the other. Hu et al. (2017) have proven the strong dependency between weather temperature and crime in China. Habibullah (2017) has shown that high temperature does have a positive impact on crime, raining, however, does have a negative impact on crime. Rinderu et al. (2018) have shown that the impact of inequality and hot weather on violent crime is positive. Jawadi (2019) indicated that unemployment shocks have had a positive impact on different kinds of crime in the UK and France. By using data for 16 countries, Anser et al. (2020) investigated the impact of socio-economic variables for the 1990-2014 period. The results indicated that per capita income and openness of the economy have had a negative and significant impact on crime, while the Gini coefficient, health expenditure and unemployment rate have had a positive effect on it. Harp and Karnauskas (2020) showed that there is a positive relationship between weather temperature on one hand and the number of crimes in the US on the other. Piatkowska (2020) demonstrated a direct impact of poverty on one hand on the commit suicide, murder and violence for 15 European countries from 1993 through 2000.

Model and Analyzing the Results

Iranian structure of both criminal activities and crime studies suffer from disorganization and discontinuity. For instance, some Iranian data for crime is not reliable, because they based on official reports which are not collected properly. Therefore, underestimation in Iranian crime is an obvious fact. One can argue that there is a huge gap between standardized studies in reporting crime on one hand, and its actual status in Iran on the other. Hence, this paper is trying to do a novel study in this regard. It is new, because firstly, it stresses on behavior of climate variables in committing a crime in Iran. Secondly, it uses macro data alongside with a regression model for analyzing climate status and its impact on committing a crime. For the empirical analysis in case of economic and climate factors influencing on criminal activities in Iran, this article utilizes the following equations:

$$LCRIME_t = \beta_1 + \beta_2 LINF + \beta_3 LUNEM + \beta_4 LRAIN + \beta_5 GE + \beta_6 LEDU + \beta_7 LGINI \quad (1)$$

$$LCRIME_t = \beta_1 + \beta_2 LINF + \beta_3 LUNEM + \beta_4 LTEM + \beta_5 GE + \beta_6 LEDU + \beta_7 LGINI \quad (2)$$

$$LCRIME_t = \beta_1 + \beta_2 LMIS + \beta_3 LRAIN + \beta_4 GE + \beta_5 LEDU + \beta_6 LGINI \quad (3)$$

$$LCRIME_t = \beta_1 + \beta_2 LMIS + \beta_3 LTEM + \beta_4 GE + \beta_5 LEDU + \beta_6 LGINI \quad (4)$$

$$LCRIME_t = \beta_1 + \beta_2 LINF + \beta_3 LUNEM + \beta_4 LRAIN + \beta_5 GE + \beta_6 LHDI \quad (5)$$

$$LCRIME_t = \beta_1 + \beta_2 LINF + \beta_3 LUNEM + \beta_4 LTEM + \beta_5 GE + \beta_6 LHDI \quad (6)$$

$$LCRIME_t = \beta_1 + \beta_2 LMIS + \beta_3 LRAIN + \beta_4 GE + \beta_5 LHDI \quad (7)$$

$$LCRIME_t = \beta_1 + \beta_2 LMIS + \beta_3 LTEM + \beta_4 GE + \beta_5 LHDI \quad (8)$$

where LCRIM is the logarithm of crime variable, LINF, the logarithm of the inflation rate, LUNEM the logarithm of the unemployment rate, LMIS logarithm for misery index (a combination of inflation and unemployment rates), GE, for real economic growth, LEDU, logarithm for Education, LGINI, logarithm for Gini coefficient, LHDI, logarithm for Human Development Index, LTEM for the logarithm of air temperature and LRAIN for raining logarithm. The dependent variable for crime is murder rate, LCRIME for the logarithm of murder rate per 100 thousand of population. So, all variables are in the logarithmic format in the models. Data for variables in question are collected from Iranian statistical yearbook (ISC), and the central bank of Iran (CBI). Meanwhile, by using GMM we used time series data for 1984- 2018. We briefly introduce some dimensions of the main variables in models in question. The misery index is an economic indicator, which was introduced by Arthur Okun (1928-1980) in the 1970s. This indicator is a combination of inflation and unemployment rates. The higher the misery index in a country, the worse the wellbeing of its citizens. This economic status, in turn, does have the potentiality to increase social and individual calamities including criminal activities. The relationship between crime and urban living is more or less straightforward. Sociologists believe that urban living, shape a kind of behavior, which influences different kinds of crimes. In addition, criminologists have confirmed the relationship between urbanization and committing crimes (Tonry and Bijlereid, 2007; Bruinsma, 2007). They argue that due to strong social cohesion in rural areas, the probability of committing a crime is lower than that of urban areas (Malik, 2016). Emigration from a rural area to big cities will bring different cultures alongside itself. Different and new atmosphere, because of emigration to big cities, effect the behavior of newcomers, and impose new economic and social pressure capable of committing crimes. Too many populations in big cities require utilizing novel managerial techniques for proper policy marking (Madah and Khairkahan, 2010). Statistical results of variables in the above models are presented in Table 1. Descriptive statistics are presented to describe the basic characteristics of the data in this study. For each variable, there is an average value, the standard deviation, the minimum and the maximum values, the Skewness, the Kurtosis, and the Jarque-Bera.

Table 1. Descriptive Statistics

	LCRIME	LINF	LUNEM	GE	LRAIN	LTEM	LEDU	LMIS	LGINI	LHDI
Mean	1.45	2.86	2.46	3.45	5.73	2.82	16.50	3.40	3.68	-0.36
Median	1.39	2.85	2.48	3.10	5.76	2.82	16.52	3.36	3.69	-0.37
Maximum	2.54	3.90	2.66	14.00	6.13	2.90	16.71	4.10	3.74	-0.22
Minimum	0.66	2.20	2.21	-6.80	5.12	2.74	16.07	3.06	3.62	-0.55
Std. Dev.	0.47	0.44	0.10	4.38	0.24	0.04	0.18	0.26	0.02	0.10
Skewness	0.28	0.36	-0.14	0.17	-0.52	-0.19	-0.63	0.69	-0.34	-0.21
Kurtosis	2.38	2.41	2.94	3.55	3.01	2.10	2.54	3.01	3.51	1.89
Jarque-Bera	0.84	1.03	0.11	0.51	1.31	1.15	2.18	2.28	0.86	1.70
Probability	0.66	0.60	0.95	0.77	0.52	0.56	0.34	0.32	0.65	0.43

Source: Research finding.

According to the Table 1, Jarque- Bera, and considering the probability it is obvious that the zero hypotheses (based on normal distribution) is not rejected. Hence, all variables incorporate normal distribution. For analyzing the stationary status of economic variables, we used KPSS testing indicating that all variables are stationary at the required level (Table 2). The data for different age groups is not available in Iran. That is the age of people who are committing in Iran is not reported. We added the Gini coefficient to the model, which indicates the inequality status. We also added the education variable based on number of students; whose age are between 18 to 29 years old.

Table 2. Unit – Root Test (KPSS)

Variable	LM Statistic	Critical Amounts		
		%10	%5	%1
LCRIME	0.199	0.347	0.463	0.739
LINF	0.117	0.347	0.463	0.739
LUNEM	0.058	0.119	0.146	0.216
GE	0.144	0.347	0.463	0.739
LMIS	0.158	0.347	0.463	0.739
LRAIN	0.108	0.119	0.146	0.216
LTEM	0.079	0.119	0.146	0.216
LEDU	0.108	0.119	0.146	0.216
LGINI	0.099	0.347	0.463	0.739
LHDI	0.122	0.119	0.146	0.216

Source: Research finding.

Table 3. Estimation of Crime (Murder) Models

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
C	1.09 (0.38)	-6.26 (-1.98)**	6.02 (1.77)**	-5.08 (-1.44)	0.44 (0.33)	-7.31 (-3.98)*	1.53 (2.61)**	-12.75 (-3.37)*
LCRIME(-1)	0.80 (16.31)*	0.64 (14.68)*	0.80 (16.61)*	0.65 (11.39)*	0.87 (14.28)*	0.58 (9.42)*	0.78 (5.83)*	0.64 (9.30)*
LINF	0.50 (9.45)*	0.46 (9.06)*	-	-	0.41 (4.38)*	0.50 (5.98)*	-	-
LUNEM	0.42 (2.51)**	0.17 (1.22)	-	-	0.79 (2.17)**	0.30 (1.07)	-	-
GE	0.030 (3.90)*	0.03 (3.90)*	0.01 (1.94)**	0.03 (6.66)*	0.05 (3.53)*	0.06 (6.26)*	0.05 (8.54)*	0.06 (4.94)*
LRAIN	-0.54 (-7.17)*	-	-0.67 (-17.31)*	-	-0.65 (-4.05)*	-	-0.70 (-4.26)*	-
LTEM	-	2.42 (9.51)*	-	1.62 (2.62)**	-	1.88 (2.80)**	-	3.26 (2.76)
LMIS	-	-	0.660 (9.25)*	0.663 (7.53)*	-	-	0.648 (4.60)*	1.048 (6.67)*
LEDU	-0.05 (-1.87)**	-0.093 (-2.24)**	-0.13 (-3.87)*	-0.06 (-2.66)**	-	-	-	-
LGINI	0.11 (0.13)	-0.17 (-0.16)	-0.63 (-0.61)	-0.13 (-0.13)	-	-	-	-
LHDI	-	-	-	-	-0.69 (-1.92)**	-0.88 (-3.27)*	-1.28 (-2.20)**	-0.97 (-2.71)**
R-squared	0.56	0.52	0.53	0.51	0.56	0.59	0.59	0.56
Durbin-Watson stat	2.37	2.18	2.27	2.20	2.67	2.34	2.60	2.37
J-statistic	7.68	8.04	7.97	7.80	6.18	8.30	7.40	7.95
Prob (J-statistic)	0.98	0.99	0.99	0.98	0.63	0.94	0.88	0.85

Source: Research finding.

Note: The t statistics are reported in the parenthesis *, **, *** Significance at the level of 1, 5, 10% respectively.

We are using the generalized method of moments, GMM estimator in this work which is suitable to be used for dynamic behavioral frameworks (Greene 2003). The results are shown in Table 3 which is concerned with murder.

We can emphasize on the following results: firstly, the relationship between misery index and crime in Iran is significantly positive. Not surprisingly, this is both compatible with relevant theories and with the actual status in Iran (Dadgar and Nazari, 2013; 2016). Dominating the double-digit inflation rate (above 35%), and unemployment (above 12%), on the Iranian economy, the results of the models are consistent with the realities of this country. Secondly, there is a positive relationship between economic growth and committing a crime as well. Of course, the coefficient of this variable is very low (about 5%). Bad governance in Iran, inefficient bureaucratic sector and underdeveloped status can mainly explain the above relationship. In other word, as some studies indicate, the stage of Iranian development is in increasing part of Kuznets's curve (Dadgar and Nazari, 2016). There is a positive relationship between developing conditions of countries on one hand and the number of crimes on the other (Northrup and Klaer, 2014). Thirdly, *ceteris paribus*, the higher the degree of air temperature, the higher the amount of crime will be. Fourthly, education and human development variables do have a negative and significant impact on crime in Iran. Fifthly the higher level of the urbanization, the more the number of crimes will be. Sixthly, the climate status including the raining and hotness of the weather do have a significant impact on crime in Iran. The more the rain, the less the crime, the warmer the climate, the higher the criminal activities in Iran. Finally, as the coefficients of variables are concerned, the climate status and weather temperature do have the most impact on criminal behavior in Iran.

Conclusion

1. Alongside economic factors including unemployment, income inequality, economic growth, and inflation rate, the climate status does have a crucial impact on committing a crime in Iran. The diversity and the number of crimes indicate a significant relationship between crimes in questions on one hand and the climate status of different societies on the other.
2. The economic factors (misery index, inflation and unemployment rates) are positively related to criminal activities in Iran. Also, education and human development variables do have a negative and significant impact on crime in Iran
3. The relationship between temperature degree and committing a crime in Iran, is significantly positive. Raining and committing crimes do have a negative relationship too.
4. According to the findings of this paper, it is recommended that: firstly, the public sector increases the investment for a reduction in the misery index. Secondly, it provides facilities in a rural area to discourage immigration from rural areas to urban areas. Thirdly, policies to improve environmental conditions are helpful to reduce crimes as well. Thus, fourthly, increasing R&D investment to improve the whole ecosystem status is recommended as well. Finally, a strong public guardianship alongside good governance in combating criminal activities is urgently required.
5. For a significant reduction in the crime in Iran, designing a package of the roadmap is required, within which restructuring the higher institutions and reforming the public sector structure are urgent. the policymakers should pay attention to the position of hot regions in Iran and provide necessary requirements for preventing crime in the very regions. Another solution for preventing crime in hot religion in Iran, are at the top, creating job opportunities, alleviating the inflation rate and improving the public education of the very area.

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