



Determinants Analysis of the Crime Rate with an Economic Approach in the Former Residence of Semarang Period 2018–2021

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Abstract. The high crime rate in a community result from the low amount of private property. It compels any person, regardless of gender, age, or other factors, to commit a crime to maintain a decent standard of living. Moreover, they could all be considered criminals. This research study aims to understand what economic factors affect the crime rate in the former Semarang residency for 2018–2021. Finding the outcomes in this quantitative study involves using pooled data regression analysis. The result of this research is that in selecting the best model, the model chosen is the Random Effect Model (REM). These results suggest that poverty, the human development index, and population density positively and significantly impact crime rates in the former Semarang Residency. Education and the open unemployment rate have a negative and significant impact on crime rates among former Semarang residents. The coefficient of determination (R^2) is 0.945095, meaning that 94.50% of the variance of the crime rate variable is explained through the variables of education, poverty, the Human Development Index, population density, and the Open Unemployment Rate. Meanwhile, the rest, 5.5%, is influenced by independent variables outside the model.

Keywords: Education · Poverty · Human Development Index · Population Density · Open Unemployment Rate · Crime

1 Introduction

Actions or omissions that are prohibited and could potentially disrupt public order can be categorized as criminal acts that result in individuals receiving criminal charges because this behavior is contrary to the law and social norms. Crime impacts people's daily lives, endangering society and the victims [20]. There will be pressure on someone in society to carry out activities against the law due to different social conditions among the people. Anyone can commit a crime, regardless of gender, age, or other factors, and they can all be considered criminals. Criminal acts can be committed consciously or unconsciously due to pressure from someone who cannot be denied [4].

The factors causing the occurrence of crime are thought to be due to the low level of welfare they have, thus triggering the occurrence of criminal acts. If the predicted profit exceeds the profit earned and the raw materials are used for other purposes, the person

may commit a crime. Some people will commit crimes not because of an inherent desire but because of calculation and financial gain [2]. Most legal experts and financial gain [2]. Most legal experts and criminal investigators agree that the instinct to persist in life is often the cause of crime. A person whose basic wants are not fulfilled will try to find a quick way to satisfy those needs [13].

Indonesia has 36 administrative divisions. The residency was first established for trade but changed its focus to general politics in the 19th century. In 1811, the Dutch leader divided the island of Java into several territorial divisions. In 1950, the division of territory was abolished and turned into a unitary form of a province. One of them is Central Java Province. This province currently has many administrative divisions; Central Java Province contains six residencies or regional divisions. There are criminals everywhere, as evidenced by the numerous instances in the Residency of Central Java.

[5, 7, 15] State that what affects the crime rate are the variables of the human development index, population density, education, income inequality, unemployment, and poverty. The research above has analyzed how the economy affects the crime rate. This research is a combination of the three researchers above. It uses the latest object, the former Semarang Residency because it is included in Central Java and has the second highest crime rate among other residents.

The Residency of Semarang is an area that gets an administrative division headed by a resident in Central Java. This residency area covers four governorates and two cities, including Semarang Regency, Kendal Regency, Demak Regency, Gerbongan Regency, Semarang City, and Salatiga City. Even though it is no longer used, the administrative division is based on place of residence. However, specific criminal acts are committed in each region by a group of people to disturb the community, such as in the former residency of Semarang.

Using the history given above as a basis, researchers will examine the influence of the open unemployment rate, poverty, population density, the human development index, and education on crime rates with an economic approach in the former residency of Semarang for the 2018–2021 period.

2 Literature Review

2.1 Definition of Crime

Economic and social pressures have influenced criminal behavior since the beginning of recorded history, according to Adler's theory of crime; poverty has been a significant contributor to crime, and this trend continues. The inability to make ends meet is a major driving factor for a crime. It shows that historically, the root cause of crime was the dire economic situation [9]. Any action that is against the law and has the potential to disturb public peace is considered a crime and can be punished by law because it is contrary to written law. Crime is an unacceptable event that all members of society should avoid by following the laws and regulations in force in the Republic of Indonesia. Crimes such as murder, robbery, fraud, and immoral acts are committed by people or organizations aware of the dangers involved, and the potential consequences of their activities will result in

the person or group violating social norms and applicable laws. Criminal behavior, such as irresistible coercion, may be committed intentionally or unknowingly.

2.2 The Effect of Education on Crime

Studying the knowledge, skills, and customs of the people passed down from one generation to the next is an educational process. A person can develop intelligence, good character, a solid personality, a strong spiritual foundation, and abilities that benefit him and the society he lives in thanks to education [12]. One of the most critical variables that will produce a highly competitive generation able to work together to achieve prosperity for each country when facing global competition in the future is human resources in the field of education [5]. Individuals with low education are more likely to commit crimes due to their low level of education and inadequate legal knowledge. Despite having financial limitations, they still have to provide for their basic needs. However, if a person has an education, it tends to make people more risk-averse, which will generally discourage them from committing the crime.

2.3 The Effect of Poverty on Crime

Poverty can be interpreted as a low standard of living in the community, namely the existence of a material deficiency in a person or group of people compared to everyday life that applies to society [18]. In general, the community is concerned with the causes. Crime is poverty resulting from difficulty meeting basic needs such as clothing, food, and shelter when a person is trapped in a cycle of poverty and limitations. As a result, people sometimes use illegal means to fulfill this need, including committing crimes or other necessities of life. According to Anomie's theory, economic crime behavior is a product of poverty and inequality or poor macroeconomic conditions; the more poor individuals there are in a place, the higher the crime rate there.

2.4 The Influence of The Human Development Index on Crime

According to UNDP (United Nations Development Programme), human development gives people more choices. The impact of initiatives to improve fundamental human resource competencies is measured using the human development index. Part of development through population empowerment that focuses on strengthening the human base is human development. The number of people with access to education, health, and purchasing power is used to calculate development. The larger the number, the more likely it is that development goals will be achieved. The Human Development Index, which evaluates how well a region has progressed in terms of human development, can have the effect of reducing crime rates, which can then lead to greater security and prosperity for residents and affect economic expansion. On the other hand, the lack of human development will impact the quality of human resources, which will make them vulnerable to patterns of criminal behavior. Criminal acts will lead to a decrease in the quality of human resources, which can impact economic growth.

2.5 The Effect of Population Density on Crime

The ratio of population to area is called population density. An area's rapid growth and development cause many residents to move there. However, the number of job opportunities varies among the population. The quality of life of the population is affected by population density. Residents' quality of life in high-population-density locations will be more difficult to improve than residents in low-density areas. Various socio-economic, welfare and security problems will follow as a result. Crime is more likely to occur in areas with dense populations.

2.6 The Effect of Open Unemployment Rate on Crime

The open unemployment rate is created by the increase in job vacancies, which is lower than the increase in the workforce. As a result, an increasing number of workers are unable to find work in the economy [14]. The result of this is that they only work for a short time. The problem of unemployment and the problem of crime are closely related, meaning that the higher the unemployment rate, the higher the crime rate. Therefore, initiatives to combat unemployment indirectly result in a reduction in crime. Therefore, there is a relationship such that if the unemployment rate increases, there will be more and more workers pressed for their needs, leading to higher crime rates.

3 Research Method

This research is quantitative and uses pooled data regression [8]. The data in this research uses secondary data. Collecting data over a certain period based on a sample population is known as "pooled data." The Central Statistics Agency (BPS) of the Central Java Province provided the data on which the whole data collection for this study was based. Pooled data regression analysis uses an econometric model to estimate the direction and magnitude of the influence of the open unemployment rate, education, population density, poverty, and the human development index on the crime rate using the economic approach of the former Semarang Residency for the 2018–2021 period with the following econometric model:

$$CRIME_{it} = \beta_0 + \beta_1 \log(EDU)_{it} + \beta_2 \log(POV)_{it} + \beta_3 \log(IPM)_{it} + \beta_4 KP_{it} + \beta_5 TPT_{it} + \varepsilon_{it}$$

Where:

- CRIME* : Criminality (Case)
- log(EDU)* : Education (Year)
- log(POV)* : Poverty (Soul)
- log(IPM)* : Human Development Index (Index)
- KP* : Population Density (per km²)
- TPT* : Open Unemployment Rate (%)
- ε : Error term
- β_0 : Constant

- $\beta_1 \dots \beta_5$: Independent variable regression coefficient
i : Cross Section (6 Regencies/Cities in Semarang Residency)
t : time series (year 2018–2021)

3.1 Operational Variable Definition

3.1.1 Dependent Variable

Crime Rate (Crime), In this study, data on the crime rate was obtained based on the number of criminal cases in the regency or city of Central Java Province. It was acquired using information from the Central Java Provincial Statistics Agency. Case unit-based crime variable.

3.1.2 Independent Variable

Education (EDU), The Central Java Provincial Statistics Agency keeps data on the average length of schooling in the districts and cities of Central Java Province, which is stated in years.

Poverty (POV), The Central Java Provincial Statistics Agency provided the data, which was gathered for the 2018–2020 period using soul units, and is used to calculate the number of impoverished individuals in the Central Java Province, Regency, or City.

The Human Development Index (HDI) examines various variables such as health, education, and the economy to determine whether an area has progressed toward development. Data for the 2018–2020 period, presented in index units, is collected from the Central Java Provincial Statistics Agency.

Population Density (KP): An area's population density is the number of people living there. In 2018–2020, the information was gathered from the Central Java Provincial Statistics Agency and was expressed in units per km².

Open Unemployment Rate (TPT), The unemployment data used in this study is the ratio of jobless people to the overall unemployment rate compared to the number of workers without jobs. The Central Java Provincial Statistics Agency provided the information between 2018 and 2020. The open unemployment rate is expressed as a percentage.

3.2 Model Selection Method

3.2.1 Command Effects Model Method

The command effect model approach presupposes that the constants between time and regions are considered the same. There is no difference.

3.2.2 Fixed Effect Model Method

The Fixed Effect Model technique posits that the variables vary due to random factors. In addition, the value of the coefficient of constant data is different due to heterogeneous factors.

3.2.3 Random Effect Model Method

In the random effect model, distinct constant values are presupposed, but what causes the constant values to vary are variables that are unknown or outside the model [19].

3.3 Model Selection Test

3.3.1 Chow Test

This test was performed between the command effect model and the fixed effect model to determine which model was the most effective [10].

3.3.2 Hausman Test

Hausman's test compares models with fixed effects versus random effects and is intended to determine the most appropriate model [10].

3.4 Model Goodness Test

3.4.1 Model Existence Test (Test F)

The F-test was used to test the regression coefficient hypothesis simultaneously. The F test is used to ensure that the selected model is feasible or not to interpret the influence of the independent variable on the dependent variable.

3.4.2 Coefficient of Determination (R^2)

The coefficient of determination is used to determine how significant the relationship between the independent and dependent variables is.

3.5 Effect Validity Test (Test t)

The t-test is used to determine whether the independent variable has an effect and is significant on the dependent variable.

4 Result and Discussion

4.1 Analysis Results

The command-effect model, the fixed-effect model, and the random-effect model are compared to see which one has the best estimate using the Chow and Hausman tests. The chosen model is the command effect model when put to the test using the Chow method. The random effect model is the one that the Hausman test chooses to use. Therefore, the Lagrange multiplier test, which determines whether the random effect model performs better than the command-effect model, must be conducted in that situation. Table 1 displays the findings from the study's pooled data regression econometric estimate methodology.

Table 1. Estimation Results of Pooled Data Regression Econometric Model

Variable	Regression Coefficient		
	CEM	FEM	REM
C	-3904338	-1380097	-3904338
LOG(EDU)	-3211076	-1051699	-3211076
LOG(POV)	2341919	-3935325	2341919
LOG(IPM)	1043173	4029899	1043173
KP	0.085754	0.265601	0.085754
TPT	-3237810	0.210746	-3237810
R^2	0.945095	0.951521	0.945095
Adjusted R^2	0.929843	0.914229	0.929843
F- Statistik	61.96743	25.51574	61.96743
Prob. Statistik F	0.000000	0.000001	0.000000

Source: Secondary data processed (2022)

Table 2. Chow Test Results

Effect Test	Statistic	d.f.	Prob.
Cross-section F	3.85289	(5,13)	0.0232

Source: Secondary data processed (2022)

4.2 Test for Estimated Model Selection

Among the Command Effect Model, the Fixed Effect Model, and the Random Effect Model, the Chow test and Hausman test are used to determine the best-estimated model.

4.2.1 Chow Test

The Command Effect Model and the Fixed Effect Model are pitted against one another in the Chow test to determine which model performs best [16]. For the Chow test, the following requirements must be met: H_0 : CEM is the chosen model; H_A : the chosen model is FEM. When the empirical statistical significance is more than or equal to $F > \alpha$, H_0 is accepted; when it is less than or equal to $F \leq \alpha$, H_0 is rejected. Table 2. The Chow test yielded this result.

Based on Table 2, if F has an empirical statistical significance of $0.0232 \leq (0.05)$, H_0 is rejected. In conclusion, the Fixed Effect Model is the best one.

4.2.2 Hausman Test

The fixed effect and random effect models are compared using the Hausman test to determine which model is the most effective. The two models chosen for the Hausman test are H_0 for REM and H_A for FEM. If $X^2 > \alpha$, empirical statistical significance H_0 is not rejected; if $X^2 \leq \alpha$, empirical statistical significance H_0 is rejected. Table 3 displays the outcomes of the Hausman test.

Table 3. Hausman Test Results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	10.07274	5	0.0732

Source: Secondary data processed (2022)

Because F’s practical significance value is 0.0732 (>0.05), as seen in Table 3, H0 is accepted. In conclusion, the Random Effect Model is the most effective.

According to the Chow and Hausman tests, the Random Effect Model has the best estimate. Tables 1 and 5 show the results of a thorough estimation of the Random Effect model.

4.2.3 Calculation of Constant Value using Selected Model

Table 4 shows the constants for each area in the district or city in the former Semarang Residency. The city with the highest value is Semarang, where it is -39043.3799999997. This is because the city of Semarang is a densely populated city and the capital city of Central Java. This makes the crime rate in the city of Semarang high compared to the regency or city in the former residency of Semarang when viewed from several variables that affect it, such as education (POV), poverty (POV), the human development index (IPM), population density (KP), and Open Unemployment Rate (TPT).

Meanwhile, the lowest value is Grobogan Regency at -39043.3800000015200. This situation is because this district, when viewed from the population of the district, is included in a district that is not populated, such as the Regency or City in the former Residency of Semarang, where population density significantly affects the high crime rate when viewed from the variables of education (POV), poverty (POV), the human development index (IPM), population density (KP), and Open Unemployment Rate (TPT).

Table 4. Effects and Area Constants

No	Region	Effect	Constant
1	Semarang Regency	1.52E-08	-39043.38
2	Kendal Regency	8.85E-09	-39043.38
3	Demak Regency	-2.91E-09	-39043.38
4	Grobongan Regency	-1.52E-08	-39043.38
5	Semarang City	2.7E-10	-39043.38
6	Salatiga City	-6.17E-09	-39043.38

Source: Secondary data processed (2022)

Table 5. Random Effect Model Estimation Model

$$\text{CRIME}_{it} = -3904338 - 3211976 \text{ LOG(EDU)} + 2341919 \text{ LOG(POV)}_{it} +$$

$$\quad \quad \quad (0.0002)^* \quad \quad \quad (0.0000)^*$$

$$1043173 \text{ LOG(IPM)}_{it} + 0.085754 \text{ KP}_{it} - 3237810 \text{ TPT}_{it}$$

$$\quad \quad \quad (0.0000)^* \quad \quad \quad (0.0344)^{**} \quad \quad \quad (0.0000)^*$$

$$R^2 = 0.945095; \text{ Adj. } R^2 = 0.929843; \text{ F-Stat} = 61.96743; \text{ Prob. F-Stat.} = 0.000000$$

Source: Secondary data processed (2022)

Note: *Significant at = 0.01; ** Significant at = 0.05; *** Significant at = 0.10;
The number in brackets indicates the likelihood of the statistical value t

4.3 Model Goodness Test

4.3.1 Model Existence Test (Test F)

When each independent variable influences the dependent variable at the same time, the model is said to be verified (the estimated regression coefficient of the model is not simultaneously zero). This study uses five independent variables, so the test hypothesis H_0 is $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$, which means all regression coefficients are zero, so together Education, Poverty, Human Development Index, Population Density and Open Unemployment Rate do not affect the crime rate in the former Semarang residency for the 2018–2021 period; The H_A is $\beta_1 \neq 0 \vee \beta_2 \neq 0 \vee \beta_3 \neq 0 \vee \beta_4 \neq 0 \vee \beta_5 \neq 0$, which means that there is one regression coefficient whose value is not zero, so together, Education, Poverty, Human Development Index, Population Density and Open Unemployment Rate together have an effect on the Crime Rate in the Former Semarang Residency for the 2018-2021 Period. H_0 is not rejected if the statistical probability $F > \alpha$; H_0 is rejected if the statistical probability $F \leq \alpha$.

Table 5 shows that H_0 is rejected because the statistical probability value of F is 0.00000.01. If education, poverty, the human development index, population density, and open unemployment rate affect the crime rate in the former Semarang Residency for the 2018–2021 period.

4.3.2 Coefficient of Determination and Interpretation (R^2)

The human development index, population density, education, poverty, and open unemployment rate together account for 94.50% of the variation in the crime rate variable, according to the value (R^2) of 0.945095. 5.5% of the total, or the remaining factors, are independent and unrelated to the model.

4.4 Test the Validity of the Effect of Independent Variables on the Estimated Model

This test will examine whether there is a genuine relationship between the independent and dependent variables. The test criteria are that the H_0 t test states $\beta_i = 0$, meaning that the independent variable does not influence the dependent variable. In contrast, the H_A

Table 6. Effects of Independent Variable on the Results of Validity Test

Variable	t	Sig. t	Criteria	Conclusion
Log(EDU)	-4.728457	0.0002	<0,01	Effect on $\alpha = 0,01$
Log(POV)	-8.36992	0.0000	<0,01	Effect on $\alpha = 0,01$
Log(IPM)	5.34553	0.0000	<0,01	Effect on $\alpha = 0,01$
KP	2.288665	0.0344	<0,05	Effect on $\alpha = 0,05$
TPT	-5.294431	0.0000	<0,01	Effect on $\alpha = 0,01$

Source: Secondary data processed (2022)

states $\beta_i \neq 0$, meaning that the independent variable influences the dependent variable. H_0 is not rejected when the prob t statistic $> \alpha$, and H_0 is rejected when the prob t statistic $\leq \alpha$ is. The effects of the validity test are displayed in Table 6 (t-test).

Based on Table 6, it is understood that all variables significantly affect the crime rate in the former Semarang Residency for the years 2018–2021.

4.4.1 Interpretation of Independent Variables

Education (EDU) has a regression coefficient of -3211976. Thus, education hurts crime rates. An increase of 1 percent will reduce the crime rate by 321,177 cases. Moreover, if education decreases by 1 percent, the crime rate will increase by 321,177 cases.

Poverty (POV) has a regression coefficient of 2341919 and a linear-logarithmic relationship pattern. When poverty increases by 1 percent, there will be 23419.19 crimes. Meanwhile, if poverty falls by one percent, the crime rate will fall by 23419.19 cases.

There is a 1043173 regression coefficient for the human development index (HDI). Thus, the HDI has a favorable effect on the crime rate. The increase in the human development index will result in a 10431.73 increase in crimes. In the interim, there will be 10431.73 fewer crimes reported if the human development index drops by 1%.

If population density (KP) has a regression coefficient of 0.085754, then population density positively affects the crime rate. When population density increases by 1 per km², what happens is that the crime rate will also increase by 0.085754 cases. Meanwhile, if the population density decreases by 1 per km², then what happens is that the crime rate will also decrease by 0.085754 cases.

The open Unemployment Rate (TPT) has a regression coefficient of -3237810. Thus, Open Unemployment Rate hurts crime rates. When the Open Unemployment Rate increases by 1 percent, what happens is that the crime rate decreases by 3237810 cases. Meanwhile, if Open Unemployment Rate decreases by 1 percent, the crime rate will increase by 3237810 cases.

4.5 Economic Interpretation

Following the validity test of the influence on the Random Effect Model, it was found that all variables in this study influenced the crime rate in the former Semarang Residency for the 2018–2021 period.

In the former Semarang Residency, education significantly and negatively impacted crime rates. The role of education is also essential, serving as a springboard for future job choices. A person's level of education and mindset can influence what they do, but not everyone with higher education will not commit a crime. Some people with better education continue to act illegally in various ways. The findings of this study agree with [14]. They state that education is not the proper benchmark because someone with an education can take advantage of particular opportunities, closing the gap between a person and a criminal. Moreover, say that education is not the proper benchmark.

Poverty has a positive and significant impact on crime rates in the former Semarang residency. This is in line with research by [1]. Because they struggle to maintain a quality of life, most of the poor become poor, which gives the poor people the opportunity to commit crimes to improve their lives. Therefore, the importance of social support, such as food needs for people who are on the poverty line, will affect how well basic needs are reduced, which will result in a decrease in the number of poor people and an alarming decline because those who are low have the needs they expect.

The Human Development Index positively and significantly influences the crime rate among the former residents of Semarang. Increasing the population's standard of living will speed up Indonesia's economic growth, as measured by the HDI indicator currently in use [7]. A significant action that can be taken to reduce the crime rate is to increase the HDI value. However, this is not given because there are some people for whom, even though every indicator of the human development index meets the requirements, it is still challenging to stop acting criminally in their hearts. After all, they believe their actions are justified because those in authority directed them.

In the former Semarang Residency, population density significantly and positively impacted the crime rate. This study is in line with research [6], which found that population density positively affects crime. This happens because population density caused by population growth limited by available licenses can reduce people's quality of life and contribute to high crime rates in an area. Improving population quality in densely populated areas will be more difficult [7]. Therefore, the presence of someone who migrates will reduce the crime rate in an area [17] due to reduced population growth, and crime rates will decrease.

In the former Semarang Residency, unemployment significantly and negatively impact the crime rate. Many studies suggest that Open Unemployment Rate has a positive effect, even though more and more people are looking for work, which makes it increasingly difficult for them to meet their basic needs. This makes people more likely to commit crimes of any kind, such as theft and fraud. In addition, a high crime rate can indicate that a place is considered a safe place for crime to occur. The best action is for the government to set fair wages so that individuals will be more satisfied with their income. This study is in line with research [3], which states that the Open Unemployment Rate significantly affects crime rates.

5 Conclusion

From the research that has been examined regarding the elements that affected the crime rate in the former Semarang Residency in 2018–2021, several conclusions can be drawn as follows. According to the test results, the model chosen in this study is the Random

Effect Model to choose the best estimator model for the model. The human development index, population density, education, poverty, and Open Unemployment Rate together account for 94.50% of the variation in the crime rate variable, according to the value (R^2) of 0.945095. 5.5% of the total, or the remaining factors, are independent and unrelated to the model. Partially, the variables of poverty, the human development index, and 2018–2021 will have a positive and significant impact on crime rates in the former Semarang Residency due to population density. At the same time, the variables of education and Open Unemployment Rate have a negative and significant effect on the crime rate in the former Semarang Residency in 2018–2021. In the F test, it was found that the model in this study using a level of 0.01 existed.

This study provides suggestions about the importance of paying attention to the factors that influence the emergence of crime in each region. Furthermore, it is hoped that each area will have high security to avoid criminal acts so that the crime rate in each area will decrease and the area will be safe from these criminal acts.

Research Contributions

The research results were expected to contribute as follows:

The government is expected to be able to create as many jobs as possible, provide educational facilities, and provide indicators of the human development index such as health, economy, and education as top priorities to advance the economy of each region and reduce crime rates in the area.

For those who handle criminal cases, increasing vital surveillance, a more effective security system, law enforcement, and public safety aim to deter criminals in an area.

Furthermore, other macroeconomic factors that are expected to impact the number of crimes that occur in each location are expected to be added for future research.

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