

# **An Empirical Investigation of Labor Market Conditions and Crime Rates in Indonesia**

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Date: 31 January 2017

## **Preface and Acknowledgements**

I wrote this thesis in completion of my study program in Economics and Business, with the specialization International Economics, at Erasmus University Rotterdam.

Firstly, I want to express my sincere gratitude to Dr. Dana Sisak for her efforts in supervising me from the beginning until the completion of this thesis. Secondly, I also thank Prof. Olivier Marie who provided me with valuable insights for my thesis. I also would like to thank all the teachers and professors who shared their knowledge during my master's program. I am very lucky to be surrounded by family and friends who always motivated me to finish my master's program and this thesis. And of course I would like to thank all the staff at Erasmus University Rotterdam for helping me in so many ways.

## **Abstract**

This study aims to pinpoint trends in crime rates in Indonesia and how these correlate with labor market opportunities from 2005-2014, with the unemployment rate and minimum wages as the key determinants. This thesis uses an empirical approach, involving 31 provinces over a 10-year period. The data show that the number of crimes in Indonesia has fluctuated, with crime rates at their highest in 2011. Employing a panel-data estimation using ordinary least square (OLS) estimation with time and province-level fixed effects, the regressions indicate that the unemployment rate does not correlate with crime rates. Meanwhile, a minimum wage does give a meaningful result and is consistent across the model. Therefore, crime trends in Indonesia are related to the minimum wages. Ultimately, all other economics determinants of crime do not seem to have any relationship with crime rates.

**Keywords:** crime rates, labor market, the unemployment rate, minimum wages, economics determinant of crime.

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# 1. Introduction

The economics and political system of every country is different, so each country has a different approach to handling crime. Governments do their best to manage crime, since criminal activities can make a country economically and politically unstable. Governments should not only enact laws and encourage people to abide by the law, as they also need to create alternatives for their citizens. In other words, governments should provide an economical solution, so people do not search for other alternatives that lead to criminal activity. For example, governments can create job opportunities or pursue realistic welfare benefits' policy. Crime has been a hot topic for centuries, also from an economics point of view. According to Becker (1968), if there are more opportunities for people to find a job, people will be less likely to commit crimes.

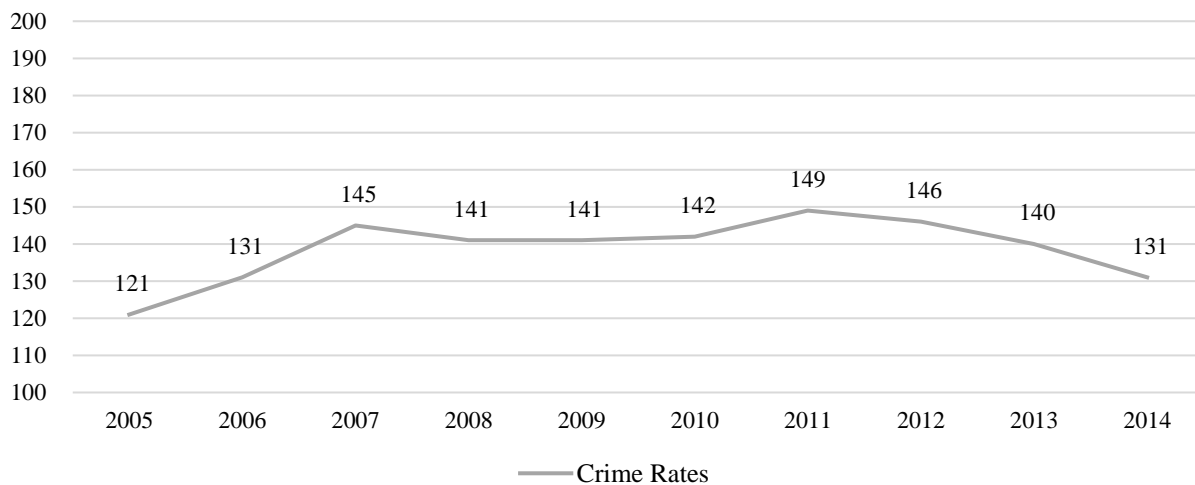
Gould, Weinberg, and Mustard (2002) stated that crime rates can be described by labor market prospects. Yet many researchers have also failed to find a firm relationship between crime rates and labor market conditions. This thesis builds upon the numerous studies that have looked at the link between labor market opportunities and crime. A high level of crime should be seen as a threat to the economic development of a country. In this research I present local data. According to previous literature in this field, using a smaller geographic aggregation will result in a more likely correlation between labor markets and crime rates (Zwiene, 2011). Additionally, using provinces as units of observation to study the relationship between crime and labor market conditions is appropriate because provincial borders limit the mobility of potential offenders more than neighborhoods or even city boundaries do. Whereas, a country or national-level analysis would cloud most important variation that are required to identify causation (Mustard, 2010). In the next section, the overview of the economic situation in Indonesia that is pertinent to the labor market and crime is discussed.

## 1.1 Crime trends in Indonesia

After the reform era in 1998, Indonesia was trying to recover from distressing times. The democratic era of Indonesia was acknowledged as the country regained its independence, and started to become more responsive to human rights issues that had previously been concealed. Indonesia had undergone a creative destruction phase and, following the recovery, it has now arrived at a stable stage in its development. Elections are now conducted democratically, economic performance has been boosted, and developments are taking place in many sectors. Nonetheless,

this does not mean that no obstacles were encountered in the process. Until now, problems such as corruption, terrorism, and drugs continue to present themselves. This means that the crime rate in Indonesia is still considerably high. In Indonesia, criminal acts can be defined as an inappropriate act or an act that is against the law by any individual (*Badan Pusat Statistik*, 2015). Crime rates include violent crime and property crime. Property crime is usually prompted by pecuniary motives (Gould, Weinberg, & Mustard, 2002; Raphael & Winter-Ebmer, 2001)).

Figure 1. Crime Rates (per 100,000 Inhabitants) in Indonesia from 2015-2014



Source: *Badan Pusat Statistik* (BPS).

Figure 1 shows the aggregate crime rate, violent crime and property crime, in Indonesia over a 10-year period from 2005-2014. The rates are based on the report per 100,000 inhabitants. Overall, the crime rate varied considerably. The graph shows that in 2005 the crime rate was at 121 and it rose to 145 in 2007. From 2007 until 2014 it fluctuated moderately. Clearly, the crime rate increased in the beginning, from 2005 to 2007, and it slowly fell between 2011 and 2014. When the global financial crisis happened in 2008, the crime rate in Indonesia was relatively stagnant. This implies that Indonesia was stable and suffered little impact due to the crisis.

## 1.2 Labor market performance in Indonesia

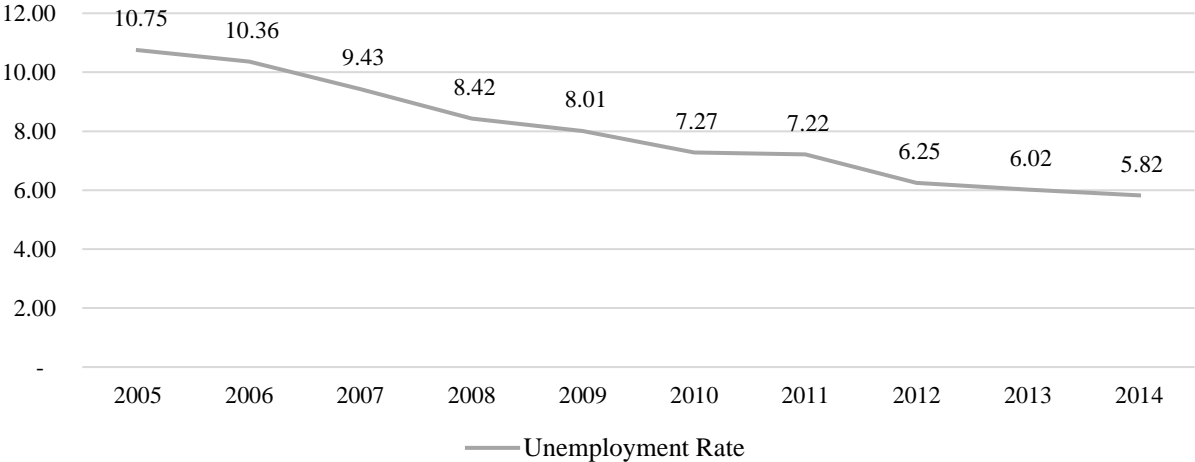
Indonesia is the fourth most populous country in the world, and is hence endowed with abundant human resources. Economic conditions, especially in the labor market sector, have a substantial effect on criminal behavior (Gould, Weinberg, & Mustard, 2002). Conditions relating to the supply and demand for labor fluctuate, as depicted by a shift in the unemployment rate



following the growth or collapse of some industries. Also, the minimum wage set by the government in Indonesia plays a vital role in regulating industries that directly affect labor market conditions. The following is a discussion about the situation of the industrial labor market movement and the government's interventions in Indonesia.

The unemployment level can be easily governed if the government cooperates effectively with the private sector. In general, the unemployment rate is cyclical and fluctuations, such as changing jobs, frequently happen within a short period of time. The unemployment rate represents all social classes, whether people have a high or a low education level and whether they are old or young people. Nowadays, employers in Indonesia are more particular when selecting labor because they can choose from more options and alternatives. This is because, when the economy is growing, many people may be looking for jobs, but job opportunities will not be available to everyone. As such, this creates a significant unemployment rate.

Figure 2. Indonesia's Unemployment Rate from 2005-2014



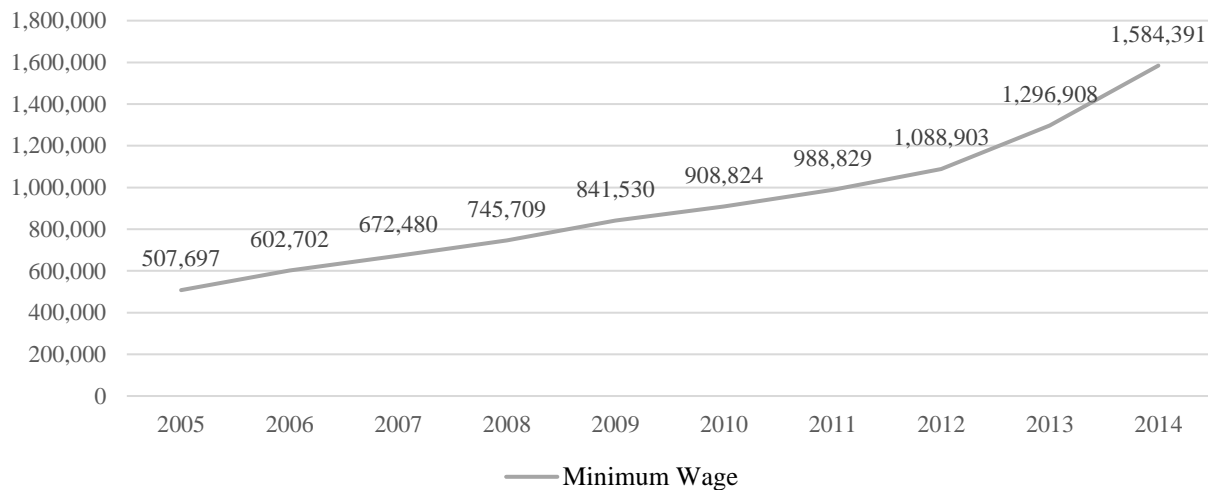
Source: *Badan Pusat Statistik (BPS)*.

Based on Figure 2, the unemployment rate in Indonesia from 2005 to 2014 showed a decreasing trend. After reaching its highest peak in 2005, at 10.75%, the unemployment rate kept falling in subsequent years and reached 5.82% in 2014. Following the 2008 global financial crisis, Indonesia's unemployment rate was in fact decreasing. This shows that Indonesia was not negatively impacted by the global financial crisis. Moreover, there was a quite stable unemployment rate between 2010 and 2011. To conclude, Indonesia has successfully improved its

labor market conditions as can be seen from the continuous decrease in the unemployment rate over time.

The effect of minimum wages on crime rates is rarely discussed by researchers, since it does not seem to have a strong influence on criminal activities. Wages play an important role, in the sense that low wages can induce people to participate in illegal activities in order to fulfil their needs. This means that people with a lower income might risk getting caught by officials and arrested, or even imprisoned. The minimum wage is often associated with blue-collar workers, in other words, workers with low skills and low education levels.

Figure 3. Indonesian Minimum Wages from 2005-2014



Source: *Badan Pusat Statistik (BPS)*.

Figure 3 illustrates changes in minimum wages in Indonesia from 2005 to 2014. In general, the level of minimum wages in Indonesia increased moderately over a period of 10 years before peaking at 1,584,391 rupiahs in 2014. The period from 2005 to 2012 shows a flatter incline, while 2012 to 2014 has a steeper incline. Moreover, there is no constant minimum wage level from one year to another. Most importantly, as the graph shows an increasing trend of minimum wages in Indonesia, this further supports the notion that Indonesia was not negatively impacted by the global financial crisis in 2008 as I mentioned before. It is clearly evident that the lowest minimum wages were in 2005 and the highest were in 2014.

To conclude, crime rates in Indonesia illustrate an unpredictable trend compared to the unemployment rate and minimum wages during the same period. These facts thus raise a question that leads to the next subchapter.

### 1.3 Research questions

People who are unemployed or those who earn minimum wages can be considered as unskilled laborers, who may have a higher propensity to commit crimes. Ergo, economic indicators can undoubtedly be considered as key factors that determine the level of crime rates. In this paper I will partly apply the research of Gould, Weinberg, and Mustard (2002), as I believe that the labor market plays a vital role in the economy. I will perform different econometric estimations. This paper analyzes the relationship between Indonesia's labor market conditions and changes in crime rates over 10 years, from 2005 through 2014. I carried out a province-level investigation, specifically in 31 provinces in Indonesia. The 31 provinces are listed in the table in Appendix 1.

Hence, the research questions of this thesis are:

- 1. Is there any relationship between the unemployment rate and crime rates in provinces in Indonesia?**
- 2. Is there any relationship between the level of the minimum wage and crime rates in provinces in Indonesia?**

I tried to be more specific by including the unemployment rate and minimum wages in order to identify the level of crime in Indonesia. These two indicators are believed to have a strong association with crime rates, as shown by a lot of earlier literature. This test is important in order to know the real situation of what is happening in Indonesia. This macro-empirical paper works through province-level data from 2005-2014 with time and cross-sectional fixed effects. I used both fixed effects because I am interested in analyzing the impact of the variables that vary over time.

To the best of my knowledge, there has been little research on these topics in Indonesia, though plenty has been undertaken outside Indonesia, such as in the United States, Europe, and New Zealand. One reason could be that a lot of data are available from the United States, Europe, and New Zealand. Nevertheless, this research will add something to the field and help us to understand the crime perspective better, in view of the fact that each country has its own unique characteristics.

### 1.4 Structure of the paper

This paper is divided into 5 chapters. The next chapter covers the theoretical framework. It discusses in-depth previous findings from other papers, the hypothesis, and how the potential

outcome could be explained theoretically. Chapter 3 gives an indication of the data and the methodology, including the sample, the tests, and the relevance of the use of all the variables. In chapter 4, I discuss the results and the analysis and present the outcomes of the tests used. Finally, in Chapter 5 I provide a summary of the results and highlight important findings and limitations, which are comprised of aspects I think should be dealt with in similar studies in future in order to obtain even better results.

## **2. Theoretical Framework**

### **2.1 Labor market determinants of crime**

Researchers and policy makers started to have an interest in investigating crime because it gives a deteriorating effect on people. It is generally acknowledged that crime can result in loss of lives and properties (Atladóttir, 2015). People will consider to do criminal activity when the expected benefit of doing a criminal activity outweighs the expected cost. The main objective of this study is to examine and explain the correlation between crime rates and the labor market based on the economic performance of Indonesia.

Earlier studies generally found a positive relationship between crime and unemployment rate. Unemployed people will have more opportunities and time to engage in criminal activity than employed people. Levitt (1997) observed the costs and benefits of working in the illegal sector. He stated that a growing involvement in crime could be explained by the decrease in labor market opportunities and in the wages of unskilled laborers (Levitt, 1997). Any opportunity losses are more likely to make people engage in some form of crime and thus risk arrest. The effects of unemployment and wages on crime were also discussed by Raphael and Winter-Ebmer (2001). According to their findings, an increase in unemployment and a decrease in wages could intensify crime rates. This finding is also supported by Uggen (2002), who suggested that when people are employed, the chances of them getting involved in any criminal activities are smaller.

As pointed out by Ehrlich (1973), the level of unemployment may be endogenous to crime. When crime rates increase in one province, investment there will slow down, thus resulting in greater unemployment. In a study done by testing the causality between crime rates and the unemployment rate, Pager (2003) observed that a criminal record reduces employment

opportunities substantially (Pager, 2003). In her sample, around 75% of employers interviewed job candidates about their criminal record, meaning that people with a criminal record have fewer chances of getting a job. This implies that there could be a reversed causality between unemployment rate and crime. In addition, the direction of causality is still unclear.

Many researchers have identified unemployment rate as the main determinants of crime. In this paper I present another main determinants of crime, namely minimum wages. According to Gould et al. (2002), the trend in wages is a better measurement for explaining trends in crime rates rather than the trend in the unemployment rate. Gould et al. (2002) found that the wages of unskilled men declined by 20% from 1979-1997 in the United States and at the same time the rates of violent crimes and property crimes escalated to 35% and 21% respectively. They found a causal relationship between decreases in wages and increases in criminal activities; in other words, declining wages encourage labor to move from the legal sector to the illegal sector. Accordingly, long-term trends in wages are better at explaining long-term trends in crime in the long run than the unemployment rate (Gould, Weinberg, & Mustard, 2002).

Cullen & Levitt (1999) suggested that high-earning people move away from areas with high crime rates. However, this finding is in contradiction with reality in Indonesia, where the movement of people is more likely to be driven by wages. People in Indonesia seek a job in big cities, such as *DKI Jakarta*, even though crime rates are quite high there, because the minimum wages offered there are usually higher compared to the wages in smaller cities. Provinces with high crime rates can push local officials to increase the minimum wage as a compensating differential to workers.

## 2.2 Other economics determinants of crime

Understanding the other economics determinant of crime is essential to know the way to alleviate crime. Few researches have studied the relationship of young male population and crime, as the age of the working population is one of the important determinants of crime. According to Gould et al. (2002), unskilled laborers and young laborers commit most crimes in the United States. Crime rates in the United States soared in the 1980s and fell in the 1990s, while the labor market outlook of young and unskilled men decreased massively in the 1980s before climbing again in the 1990s (Gould, Weinberg, & Mustard, 2002). Instead of committing themselves to criminal activity, young people should learn and practice more in order to broaden their knowledge and

skills and be able to obtain higher wages. People who have already committed criminal acts are less unlikely to engage in legal activities later (Mocan, Billups, & Overland, 2005). The opportunity costs of criminal behavior are enormous, although the rewards too are big. This is a worrying factor in respect of the younger generation, as it makes the younger population prone to act criminally.

Furthermore, Gould et al. (2002) also analyzed whether there is a relationship exists between the level of prosperity and crime rates. They found that there are possibilities that an increase in the prosperity level leads to more materials available to steal, thus inducing higher crime rates. On the contrary, Fajnzylber, Lederman, and Loayza (2002) suggested that a negative correlation exists between wealth and crime. As people become wealthier, they have a tendency to invest more in security, and this will lead to a decrease in crime rates. Whereas, Western (2002) argued that a high crime rate leads to lower wealth because it reduces the possibility of getting a job and being paid high wages. The connection between these two phenomena is still a grey area, thus leaving a big question to be solved.

Since its inception, economics literature on crime has considered the importance of income distribution as a determinant in defining the incidence of crime. A study conducted by Fajnzylber et al. (2002) found a positive, significant, and robust correlation between income inequalities, represented by Gini coefficients, and violent crime. This is both between and within countries, and over time. Their study investigated robberies in 37 countries during 1970-1994 and homicides in 39 countries during 1965-1995 with non-overlapping 5-year averages. A feeling of unfairness and disadvantages of income distribution leads the unfortunate to seek compensation by committing crimes not only against the rich, but also against the poor (Fajnzylber, Lederman, & Loayza, 2002). Fajnzylber et al. (2002) also controlled for other potential crime factors such as welfare and education level. Furthermore, François Bourguignon (1999) presented the theoretical net potential gains from crime by looking at wealth differences between the poor and the rich.

A topic of growing interest in economic journals on crime is the neighborhood effect. Kling, Ludwig, and Katz (2005) explained that people's criminal behavior depends upon the neighborhood in which they live. Sampson, Morenoff, and Gannon-Rowley (2002) summarized literature about the neighborhood effect on crime and inferred that there is a solid correlation.

Summing up all the theoretical frameworks, I can conclude that there appears to be a correlation between the unemployment rate or minimum wages and crime rates.

## 2.3 The hypothesis

Previous studies drew different conclusions on the correlation between labor market opportunities and crime rates. Building upon these and based on the objective of this thesis, I have developed a theory behind the relationship between crime rates and the unemployment rate and minimum wages.

First, in Indonesia, when people are struggling to find jobs or during periods of high unemployment, the country experiences higher crime rates. This is because people who are jobless are more motivated to commit crimes in order to improve their living standards. Accordingly, hypothesis 1 is:

*Hypothesis 1: The higher the unemployment rate in a province, the higher the crime rate, indicating a positive relationship between the unemployment rate and crime rates.*

Second, the theory is clear that when minimum wages increase, crime rates decrease, because the incentive to participate in illegal activities is reduced. Thus, hypothesis 2 is:

*Hypothesis 2: The higher the minimum wage in a province, the lower the crime rate, indicating a negative relationship between minimum wages and crime rates.*

Hypothesis 1 is linked to what Uggen (2000) and Raphael and Winter-Ebmer (2001) found in their papers and hypothesis 2 is exactly what Gould, Weinberg, and Mustard (2002) concluded. These hypotheses can be tested by looking more deeply into the data available on crime rates and labor market conditions.

## 3. Data and Methodology

### 3.1 Data sample

Indonesia consists of 34 provinces, but I only focused on 31 provinces. This is due to a lack of data for three provinces that were only recently established, namely *Kalimantan Utara*, *Sulawesi Barat*, and *Papua Barat*. There should have been 310 observations (10 years and 31

provinces) from the data I gathered from the *Badan Pusat Statistik* (Central Bureau of Statistics or BPS) and the Ministry of Manpower and Transmigration, but some observations were missing from the sample. As a result, the number of observations was reduced to 217. Using observational data to find a causal relationship can be troublesome and is often inconclusive, as the data are not randomized. Therefore, I will place more emphasis on finding a correlation between the predictor and the dependent variable.

### 3.1.1 The dependent variable

In this thesis, *CrimeRate* is my dependent variable and it represents the aggregate crime rate. Due to lack of data, I cannot differentiate between property crime and violent crime. The separation of crime is important, because every crime occurs with a different agenda. For the aggregate crime rates, the BPS obtained the data from *Kepolisian Negara Republik Indonesia* (the National Police of the Republic of Indonesia or Polri). The crime rates are offences per 100,000 of the population, gathered from the local police office in each province. In other words, it is the risk of civilians to become victims of crime. Most of the crime data are self-reported. The legal and criminal justice systems across the provinces are similar, so comparison between provinces is justifiable.

### 3.1.2 The independent variables of interest

*UnemploymentRate* represents the number of people unemployed in each province. There is not much of a problem with the unemployment rate data, which I also obtained from the BPS. Only one observation was missing from the data. Meanwhile, the data on minimum wages uses real values, per province, after being adjusted for inflation for the given years. This is illustrated by Figure 3 (see above), which shows an increasing trend. The Indonesian currency is the rupiah. Due to the high currency rate of Indonesia, I omitted three zeros (000) from the minimum wage when explaining the change in crime rates. This makes it easier to explain the results. Thus, the *MinimumWage* variable is the real minimum wage in each province, with three zeros (000) omitted. The data were obtained from the same resource as crime rates and the unemployment rate, namely the BPS.

$$MinimumWage = \frac{Real\ Minimum\ Wage}{1000}$$



I was interested to see the implications of the unemployment rate and the minimum wage. Referring to Uggen (2000), Raphael et al. (2001), and Gould et al. (2002), I expected the unemployment rate to have a positive correlation with crime rates, while the minimum wage would have a negative correlation with crime rates.

### 3.1.3 The control variables

I added the size of the young male population in each province, using the young male population of a working age who are aged 15-24 years old, in order to tell whether the unemployment and wages indicators are subject to different numbers of young men. This variable is *YoungMale*, which is to prevent bias estimation caused by changes in the demographic structure of the province, and which are correlated with changes in labor market opportunities. The number of young men determines the intensity of crime in each province, as young males commit most crimes (Gould, Weinberg, & Mustard, 2002). Therefore, I expected an increase in the number of young males to be negatively associated with crime rates. I obtained the data from The Ministry of Manpower and Transmigration of Indonesia.

I obtained a proxy measurement of wealth in each province using a *MinimumLivingCosts* variable. This represents the minimum living costs per month in each province. As mentioned in previous literature, when wealth decreases, less material is available to steal, thus crime may decrease (Gould, Weinberg, & Mustard, 2002). Or people may spend less on self-protection, thus causing crime to increase (Fajnzylber, Lederman, & Loayza, 2002). The correlation between wealth and crime is still uncertain. Including this variable in the model enables me to solve the problem of vagueness and have control over any correlation between each province's economic welfare and its labor market performance. Therefore, it is interesting to see the effect in Indonesia.

The last variable is a *Gini*, representing Gini coefficients, which is an income distribution measurement in each province. Provinces with high Gini coefficients create disparity which causes the poor to feel envious and suppressed towards the rich. People who commit crimes often have low income or are unemployed. Hence, when the Gini increases in one province, the crime rate also increases (Fajnzylber, Lederman, & Loayza, 2002). I collected the data on minimum living costs and the Gini from the BPS.

#### 3.1.4 Descriptive statistics

I explained crime rates in Indonesia earlier. Again, the rates are per 100,000 of the population. In the figure in Appendix 2 and Appendix 3 (see Appendix), I present the political map of Indonesia and the crime rates of each province through the years. The following is a brief summary of the graph. In 2006 *Kepulauan Riau* immediately reached the peak in *Sumatera* island until 2011. After that, the crime rates decreased to around 200-250. The crime rates in *Sumatera Selatan* display an incrementally increasing trend from 2003 until 2014, following the pattern of *Sumatera Utara*, *Sumatera Barat*, *Jambi*, and *Bengkulu*. *Bangka Belitung* reached a crime rate of 500 in 2012, which was its highest rate in the sample. From 2005 to 2007, *DKI Jakarta* experienced a stagnant crime rate. After that until 2014, the crime rate was less intense. Meanwhile, *Yogyakarta* had a stable trend until 2006 and tipped to a crime rate of 512 in 2010, which means *Yogyakarta* has the highest crime rate over 10 years in *Jawa* island and Indonesia. Last but not least, *Jawa Timur* joined *Jawa Barat*, *Banten*, and *Jawa Tengah* with low and unwavering crime rates.

Next we move on to *Bali* and the nearby islands. *Bali* had a volatile crime rate from 2005. It went up until 2009 with a crime rate of 225, after which it seemed that the crime rate was well-handled until 2014. From the graph, it is clear that *Nusa Tenggara Barat* has a low crime rate but it escalated through the years until 2010. Contradictorily, *Nusa Tenggara Timur* has an unpredictable pattern and the trend fluctuated over time. The rate fell significantly in 2010 to 81 and rose back to around 150 afterwards. In the central region of Indonesia, the crime rate in *Kalimantan Barat* is shown to have an increasing trend from 2005 to 2008, but it then began to stabilize through 2014. *Kalimantan Tengah* has a wavering crime rate, and ended with the lowest crime rate in 2014. In *Kalimantan Selatan*, the crime rate seems rather manageable. From the graph, it can be seen that *Kalimantan Timur* started with highest rate in 2005 and ended on top in 2014 with a crime rate of 230.

In the eastern part of Indonesia, *Sulawesi Utara* reached its lowest point in 2013 with a crime rate of 224. Secondly, *Gorontalo* province had an unstable crime rate and in 2014 had its highest crime rate of 305. *Sulawesi Tengah* is considered to have a stable crime rate, though it suddenly reached 493 in 2013. Besides *Sulawesi Selatan*, the lowest crime rate was in *Sulawesi Tenggara*. This province had a crime rate of 36 in 2005 and become the second lowest crime rate in 2014 in *Sulawesi* island. To the very east of Indonesia there are the islands of *Maluku* and *Papua*.

Due to the close geographic proximity of *Maluku* and *Maluku Utara*, they share similarities in terms of region, culture, and ethnicity, resulting in a similar pattern of crime rates. There was only a difference in 2006 when *Maluku Utara* surpassed *Maluku*, with crime rates of 99 and 82 respectively. *Papua* itself already had a high crime rate, since many conflicts have occurred in *Papua* from the early years when Indonesia gained its independence from the Netherlands in 1945.

Table 1 summarizes the statistics of variables that I used in this thesis. By looking at the maximum and minimum values of the crime rates as my dependent variable, the table shows that the data are very dispersed. I gathered the data from BPS and the Ministry of Manpower and Transmigration, both of which provide extremely reliable data, as they are official institutions in Indonesia. Some variables like crime rates and minimum wages are available for all provinces and years with 310 observations, but for others they are not fully present, so I have only 217 observations instead of 310. The average rate for unemployment in Indonesia was at 6.41 percentage points for 31 provinces in the 10-year period, which is fairly high. Another interesting fact is that the average of minimum living costs per month exceed the average of minimum wages per month.

Table 1. Summary of Descriptive Statistics of All Variables

Variable	Obs	Mean	SD	Min	Max
<i>CrimeRate</i>	217	197.7373	99.71431	13	557
<i>UnemploymentRate</i>	217	6.414574	2.674947	1.63743	14.93535
<i>MinimumWage</i>	217	1048.201	333.5133	500	2441
<i>YoungMale</i>	217	683.7326	831.1718	89.8685	4130.978
<i>MinimumLivingCosts</i>	217	1168.928	363.5085	544.157	2299.86
<i>Gini</i>	217	36.02765	4.188738	26	46

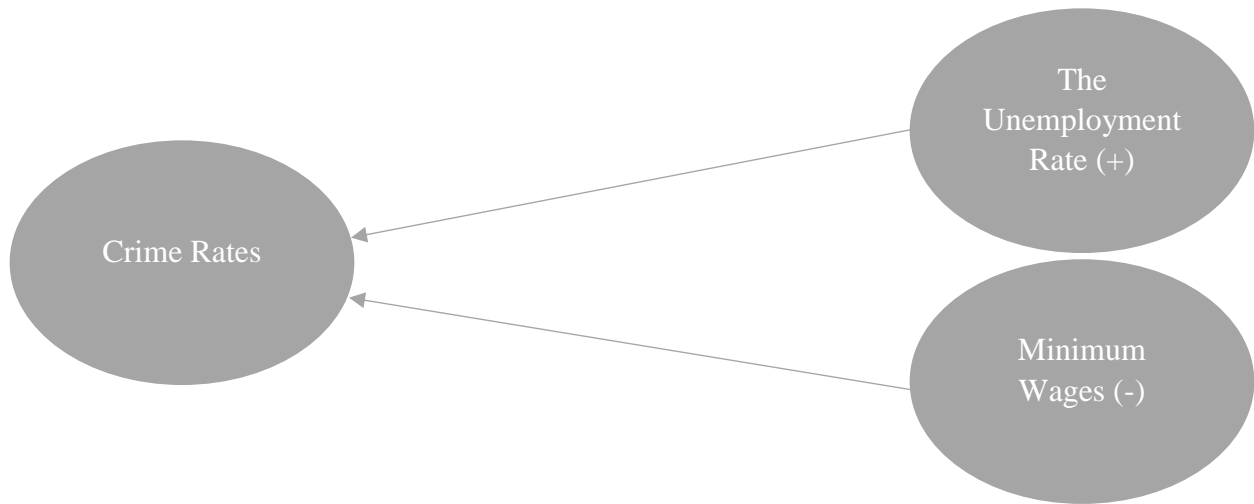
### 3.2 Methodology

I performed an empirical test to examine the relationship between labor market conditions and crime rates in each province in Indonesia. Figure 4 depicts the relationship of the unemployment rate and minimum wages on crime rates, for which I expected positive and negative relationships respectively. I chose the unemployment rate and minimum wages as indicators of the labor market, as these two are the variables of interest. I ran a panel regression by using annual

province-level data from 2005-2014 on 31 provinces using STATA. Implementing the panel data on the lowest area level, such as province, should give fruitful insights into the relationship between labor market conditions and crime.

I implemented time and cross-sectional fixed effects in this thesis. The time and cross-sectional fixed effects remove the effects of cross-province variations in reporting methods. They also control the ignored province-level heterogeneity that might be interrelated with each province's crime rate. If the unobserved dimension is invariant over time, then any changes in crime rates must be because of other impacts than the fixed province characteristics. In other words, the inclusion of fixed effects should ease the omitted variable bias from unobserved variables. This thesis also has strongly balanced panel data.

Figure 4. The Relationship between the Unemployment Rate and Minimum Wages and Crime Rates



The model is more relevant to the real world, since it takes into account other determinants of crime such as: young male population of a working age, minimum living costs per month, and Gini coefficients. I used several models to test whether economic conditions, especially labor market conditions, are correlated with crime. I tried to estimate five different models.

First, starting with a basic OLS regression, using minimum wages and the unemployment rate as my two most important indicators:

$$CrimeRate_{i,t} = a_t + \gamma_i + \beta_1 UnemploymentRate_{i,t} + \beta_2 MinimumWage_{i,t} + \varepsilon \quad (1)$$

In this regression, *CrimeRate* is the dependent variable and it represents crime rates. Further, *UnemploymentRate* represents the unemployment rate in each province, *MinimumWage* is the real minimum wage in each province, though omitting three zeros (000), whereas  $\varepsilon$  represents the error term.  $a_t$  and  $\gamma_i$  denote time and cross-sectional (province) fixed effects in the model, while,  $i$  represents the province and  $t$  represents time. This first model may be not a decent model, but it is a good point to start the analysis. The underlining point of this model is that it gives us an idea of the correlation between crime rates and independent variables, so offering a quick insight into crime conditions in Indonesia.

Model 2 extends model 1 with a potential role played by control variables, exemplified by the number of young men involved in the crime-inducing effect of labor market conditions:

$$CrimeRate_{i,t} = a_t + \gamma_i + \beta_1 UnemploymentRate_{i,t} + \beta_2 MinimumWage_{i,t} + \beta_3 YoungMale_{i,t} + \varepsilon \quad (2)$$

In this model, I controlled regression with *YoungMale*, which is the size of the young male working-age population aged between 15-24 years old. Other variables and notations represent the same meaning as in the previous model. Provinces that have a high number of young males tend to have higher crime rates (Gould et al, 2002; Freeman, 1996). The size of the young generation is a central key for future development of the economy, especially in the criminal sector.

Regression 3 includes a new independent variable as discussed in Gould et al. (2002), to control the unemployment rate and minimum wages with the level of wealth:

$$CrimeRate_{i,t} = a_t + \gamma_i + \beta_1 UnemploymentRate_{i,t} + \beta_2 MinimumWage_{i,t} + \beta_3 MinimumLivingCosts_{i,t} + \varepsilon \quad (3)$$

In model 3, I added *MinimumLivingCosts* as an indicator of wealth in each province. Other variables and notations represent the same meaning as the previous model. I added this additional variable to control the level of the standard of living on criminal opportunities and for changes in level of wealth in each province.

Next is model 4, which includes the control variable to control income inequality across the provinces:

$$CrimeRate_{i,t} = a_t + \gamma_i + \beta_1 UnemploymentRate_{i,t} + \beta_2 MinimumWage_{i,t} + \beta_3 Gini_{i,t} + \varepsilon \quad (4)$$

Here *Gini* represents Gini coefficients, which is an income distribution measurement in each province. Other variables and notations represent the same meaning as the previous model. High inequality creates an income effect where people tend to seek extra sources of income in many different ways, both legal and illegal. Thus, the income effect captures criminal opportunities that might occur in Indonesia.

Model 5 is the last model to test, which includes all control variables to amplify the equation:

$$CrimeRate_{i,t} = a_t + \gamma_i + \beta_1 UnemploymentRate_{i,t} + \beta_2 MinimumWage_{i,t} + \beta_3 YoungMale_{i,t} + \beta_4 MinimumLivingCosts_{i,t} + \beta_5 Gini_{i,t} + \varepsilon \quad (5)$$

All the variables in this model are the same as in the previous models. The interpretation of the beta coefficients is for a given province. I put the controlled variable for the young male working-age population, the standard of living, and inequality level together to better observe the correlation between dependent and independent variables. With this complexity, the model becomes more realistic. The relationship is expected to be the same as mentioned earlier in this paper.

After forming all the equations, I can test both the hypotheses. I can answer hypothesis 1 and hypothesis 2 with all the equations, because these two are my main indicators. The total number of young males can be observed with models 2 and 5. Furthermore, the level of welfare and the crime rate can be identified through models 3 and 5. Considering the extent of Gini coefficients on crime rates, the effect can be seen in regressions 4 and 5. In Table 2, I provide a summary of the variables used in this paper.

### 3.3 Limitations

Even though the observations in this research are for 31 provinces and involve 10 years of data, there could be problems in the data. One problem might be missing observations, especially in the control variables. This would limit the investigation from a practice perspective.

Additionally, self-reported crime involves some problems, as the crime data may have been under-reported, which could cause a measurement error in crime rates. This problem is worse in provinces where there is an unreliable justice system, a high inequality of income distribution, and low education levels (Fajnzylber, Lederman, & Loayza, 2002).

One of the main limitations of this thesis is that I was unable to distinguish between property crime and violent crime data. I tried to find province-level data for property and violent crimes, but it is not easily accessible. I was only able to find the property and violent crime rate on a national level. The segregation into provinces is essential for the analysis, as it gives more meaningful results, where violent crimes are clearly committed based on a less pecuniary agenda than property crimes (Gould et al, 2002; Raphael and Winter-Ebmer, 2001). Thus, this weakness is one of the points for improvement for officials in Indonesia. Nevertheless, data from Indonesia is improving all the time.

Table 2. Description of Variables, Expected Sign, and Theoretical Reasoning

Variable	Type	Description	Used in model	Expected sign	Theoretical reasoning
$CrimeRate_{i,t}$	DV	Crime rates of province $i$ period $t$	All models	n/a	n/a
$UnemploymentRate_{i,t}$	IV	The unemployment rate of province $i$ period $t$	All models	(+)	According to Raphael et al. (2001) and Uggen (2000), the unemployment rate has a positive relationship with crime rates.
$MinimumWage_{i,t}$	IV	Minimum wages, with three zeros (000) omitted, of province $i$ period $t$	All models	(-)	According to Gould et al. (2002), the minimum wage has a negative relationship with crime rates.
$YoungMale_{i,t}$	CV	Young male working-age population between 15-24 years old of province $i$ period $t$	2 and 5	(+)	According to Gould et al. (2002), crime rates increase with an increase in the number of young males.
$MinimumLivingCosts_{i,t}$	CV	Minimum living costs per month of province $i$ period $t$	3 and 5	(+)	An increase in the standard of living will lead to a higher crime rate, since more material is available to steal (Gould, Weinberg, and Mustard, 2002).
$Gini_{i,t}$	CV	Gini coefficients of province $i$ period $t$	4 and 5	(+)	The higher the Gini coefficients, the higher the crime rate (Fajnzylber, Lederman, & Loayza, 2002).

DV stands for Dependent Variable. IV stands for Independent Variable. CV stands for Control Variable.



## 4. Results and Analysis

Before conducting all the regressions, I tested whether there is multicollinearity, which can arise if one or two of my independent variables are correlated. To check this problem in my regressions, I used a Variance Inflation Factor (VIF). The table in Appendix 4 shows that the problem does not exist as all variables have low multicollinearity. I also provided a Pearson's correlation coefficients matrix for all variables in the table in Appendix 5 (see Appendix) with 217 observations. Pearson's correlation quantifies the direction and power of the linear relationship between one variable and another. This thesis also delivers a consistent standard error for OLS regression. The standard error can emerge from many problems, such as heteroscedasticity and normality. I used Huber-White's robust variance covariance estimator to make the standard errors of the variables robust by correcting heteroscedasticity and the normality problem.

What follows is a description of the output of all the empirical models. I tested five differently specified regressions as can be seen from the three tables. Firstly, the table in Appendix 6 (see Appendix) presents the output for the first four models without time and province-level fixed effects. Secondly, Table 3 presents the output of the first four models with both fixed effects. Lastly, Table 4 presents the last model with both fixed effects (FE) and without both fixed effects (No FE). By using fixed effects, I omitted unobserved variables that remained unchanged over time between the provinces.

Equation 1 is presented as model 1, and the same holds for the remaining four equations. All the tables contain the results of all models with the significance levels, coefficients, and standard errors (in parentheses). They present the results for the indicator of interest, which tested the two hypotheses and the control variables. In the following segment, I interpret the results statistically from each model. In the next sub-section, I interpret all the models without both fixed effects.

### 4.1 Empirical findings from province-level panel data models without both fixed effects

I present regression for the five models without time and province-level fixed effects to give a comparative perspective. I will discuss the results in brief, as I am more interested in the model with both fixed effects because each province has its unique characteristics that may or may

not influence the explanatory variables. The results show that the minimum wage is significant with a level of 5% in model 1 and with a level of 10% in models 4 and 5. The minimum wage is positively correlated with crime rates. Young males between 15-24 years old significantly differs from zero at the level of 1% in models 2 and 5, and negatively associated with crime rates. Minimum living costs per month were also significant in model 5 with a 5% level, and positively related to crime rates. Which means that all significance variables have no representative sign. This means there are some time-invariant dimensions that influence the variables. No other variables show significance. I will not go into any depth about this regression because no strong conclusion can be drawn from it.

Table 3. Empirical Findings of Labor Market Performance and Each of the Other Indicators on Crime Rates in Indonesia with Both Fixed Effects

	1	2	3	4
<i>UnemploymentRate</i> <sub><i>i,t</i></sub>	-8.806 (7.387)	-8.744 (7.432)	-8.083 (7.596)	-11.74 (7.362)
<i>MinimumWage</i> <sub><i>i,t</i></sub>	-0.0577** (0.0278)	-0.0577** (0.0279)	-0.0718* (0.0407)	-0.0503* (0.0249)
<i>YoungMale</i> <sub><i>i,t</i></sub>		0.0127 (0.0390)		
<i>MinimumLivingCosts</i> <sub><i>i,t</i></sub>			0.0188 (0.0308)	
<i>Gini</i> <sub><i>i,t</i></sub>				-2.650 (2.260)
Constant	314.7*** (69.31)	305.6*** (79.80)	302.9*** (71.28)	421.2*** (122.4)
Observations	217	217	217	217
<i>R</i> <sup>2</sup>	0.035	0.036	0.037	0.048
Adjusted <i>R</i> <sup>2</sup>	0.026	0.022	0.024	0.034

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The dependent variable is the crime rate. Robust standard error was applied to correct for heteroscedasticity and normality. Standard errors in parentheses. Province and time fixed effect were applied. Minimum wages variable, after omitting three zeros (000) because of the large numbers that Indonesia's currency rate involves.

## 4.2 Empirical findings from a province-level panel data model with both fixed effects

### 4.2.1 Model 1: The core specification

As I mentioned before, this is a very basic model. Column 1 shows the results for regression on the basic independent variables with both fixed effects for exploring the relationship with crime rates within provinces. The unemployment rate sign is not in line with the expectation and does not explain the change in crime. This is counterintuitive to what Raphael and Winter-Ebmer (2001) and Uggen (2000) found in their paper. The proposition for minimum wages, that offering high wages could reduce criminal activity, does apply here. This is analogous to what Gould et al. (2002) found previously. This result is as anticipated, as it is also significant at a 5% level. The minimum wage went up by 1000 rupiahs, while crime rates dropped by 0.0577. This means that only one indicator of interest significantly differs from zero. The constant in this model has a positive sign and is significant at the 1% level. However, since the  $R^2$  is only 0.035, the model cannot be considered as very good, but simply serves as a foundation for further discussions.

### 4.2.2 Model 2: The core specification with the young male population as a control variable

In the second column, I used the size of the young male working-age population in each province as a control. This measure was employed by Gould et al. (2002) in their basic OLS estimation. The variable is insignificant and has a positive sign with the crime rate. The level of significance and the sign for the constant, the unemployment rate, and minimum wages are the same as for the previous model. When the minimum wage reaches 1000 rupiahs, the crime rate falls to 0.0577 per 100,000 people. The minimum wages variable is significantly different from zero at 5% level. The number of  $R^2$  increased slightly to 0.036, due to the power of the control variables.

### 4.2.3 Model 3: The core specification with standard of living as a control variable

In this model the constant is still significant and has a positive sign. The unemployment rate is still insignificant and has a negative sign with the crime rate. This is not in accordance with previous economic findings. As Gould et al. (2002) found, the size of the minimum wage has a negative correlation with crime rates in provinces in Indonesia. Again, I found that it was statistically significant. The level of significance is weaker and becomes 10%. A 1000 rupiahs increase in the minimum wage reduces the crime rate by 0.0718 per 100,000 inhabitants. This

column relates to the welfare of each province. The minimum living costs variable is statistically insignificant, it is not as Gould et al. (2002) predicted. Additionally,  $R^2$  is increased compared to models 1 and 2, becoming 0.037.

#### 4.2.4 Model 4: The core specification with income distribution as a control variable

This fourth model takes into account Gini coefficients as a control variable. Gini coefficients do not influence the level of the crime rate and the sign is not as projected. Analogous to the previous model, the minimum wage variable is still significant with a 10% significance level. A 1000 rupiahs increase in minimum wages reduces the crime rate by as much as 0.0503 per 100,000 inhabitants. The statistical significance, size, and sign of the unemployment rate appear to be unaltered from the previous model by the inclusion of this proxy for income distribution. Still, it has an inverse relationship. The explanatory power of model 4 improves to 0.048.

#### 4.2.5 Model 5: The core specification with all control variables

Model 5 combines all the control variables included in second, third, and fourth columns in Table 3. The results are shown in Table 4 (column with FE). The fixed effects control the unobserved dimension within each province that may impact or bias the variables. As in Model 3, the minimum living costs variable is insignificant with positive sign. The Gini coefficients shows no level of significance with counterintuitive sign. The control variable that signifies the level of welfare, minimum living costs per month, is still insignificant. The proposition does not apply, that when a province become more prosperous, as indicated by a positive sign, people have a tendency to participate in criminal activity.

The minimum wage still results in the expected sign with statistical significance. An addition of 1000 rupiahs to the minimum wage alleviates crime rates by 0.0675 per 100,000 inhabitants. Unlike minimum wages, the unemployment rate is consistent with no effect on crime rates. In addition, it has a negative connection. This result is quite alarming for me, knowing that the unemployment rate is one of my indicators of interest. Most importantly, the minimum wage keeps its sign unchanged and still significance in the crime rate regression, even when all other crime determinant are controlled. The constant shows pattern similar to all former models, with significances and positive signs. At this regression, the  $R^2$  increased to 0.051, which shows that the model is a better representation.

Table 4. Empirical Findings of Labor Market Performance and Combined Indicators on Crime Rates in Indonesia with and without Both Fixed Effects

	Model 5	
	No FE	FE
<i>UnemploymentRate</i> <sub><i>i,t</i></sub>	2.640 (2.975)	-10.94 (7.453)
<i>MinimumWage</i> <sub><i>i,t</i></sub>	0.0444* (0.0264)	-0.0675* (0.0390)
<i>YoungMale</i> <sub><i>i,t</i></sub>	-0.0574*** (0.00594)	0.00208 (0.0355)
<i>MinimumLivingCosts</i> <sub><i>i,t</i></sub>	-0.0580** (0.0287)	0.0233 (0.0317)
<i>Gini</i> <sub><i>i,t</i></sub>	1.943 (1.654)	-2.750 (2.321)
Constant	171.3*** (59.60)	409.2*** (129.1)
Observations	217	217
<i>R</i> <sup>2</sup>	0.230	0.051
Adjusted <i>R</i> <sup>2</sup>	0.212	0.028

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The dependent variable is the crime rate. Robust standard error was applied to correct for heteroscedasticity and normality. Standard errors in parentheses. Province and time fixed effect were applied. Minimum wage variable after omitting three zeros (000), because of the large numbers that Indonesia's currency rate involves. No FE means without time and province-level fixed effect. FE is with time and province-level fixed effects.

### 4.3 Economic and policy implications

Fixed effects help to eliminate the effects of time-invariant characteristics, making it possible to evaluate the net effect of all explanatory variables on crime rates. From the statistical results, the level of the unemployment rate frequently bore no relationship to crime rates. All models show that the unemployment rate does not affect crime rates. According to hypothesis 1, I would expect a positive correlation between the unemployment rate and crime rates, yet the results show the reverse. The unemployment rate is consistent with a negative sign. This is in contrast with economic theory. Hence, the first hypothesis is rejected based on the findings in this thesis. In the period of high unemployment, people will have less job opportunities. According to Uggem

(2000) and Raphael and Winter-Ebmer (2001), an increase in the unemployment rate could intensify the chance of becoming involved in criminal activities.

I anticipated this result for several reasons. First, I believe that one of the reasons for the false interpretation of the unemployment rate could be because of the use of aggregated crime data. Because of the pecuniary motives behind property crime, the income effect from being unemployed should affect property crime rates more (Gould, Weinberg, & Mustard, 2002). Second, as the unemployment rate accounts for total employment in Indonesia, I should have made a distinction between male and female unemployment. According to Gould et al. (2002), young unskilled men commit most crimes. The rates of both male and female unemployment in Indonesia decreased from 2005-2014, with the rate of female unemployment always bigger than that of male unemployment (World Bank, 2016). Therefore, the total unemployment rate does not have any relationship with crime rates. Third, according to Gould et al. (2002), crime should be more responsive to long-term changes in labor market conditions than to short-term fluctuations, because people might unexpectedly move from one job to another. The unemployment rate in Indonesia could reflect short-term fluctuations, since the trend of unemployment is enhanced every year.

Fourth, the Indonesian economy is typified by a high proportion in the informal sector, which accounted for around 70% of total employment in 2005 and had decreased to 60% in 2015 (OECD, 2016). Even though it has a decreasing trend, the informal sector of total employment still dominates the Indonesian economy. This implies that crimes may also be committed by those who are informally employed and economically inactive persons, who are not regarded as belonging to the labor force. Lastly, people who are employed can also commit an illegal act. For example, when people get fired – and become unemployed – because they were caught committing a crime. According to Melick (2003), crimes can occur not only as a result of malicious motives, but also when there is high opportunity for people to commit them. Given the variety of crimes in Indonesia, what is happening in Indonesia could be because crimes are not committed solely by the poor, but also by the rich, such as white-collar crime. This fact confirms the notion that criminal activity is also performed by people who are employed.

Considering all the various possibilities, it is hard for me to find any causality between the unemployment rate and crime rates. Hence, this finding is not aligned with previous economics

literature, where the unemployment rate was significant and displayed a positive relationship with crime rates.

According to all regressions, the minimum wage does determine the crime rate in provinces in Indonesia. This is one of my variables of interest. The minimum wages variable is significant and has a negative correlation with crime rates. The sign is consistent with prior findings by Gould et al. (2002), who stated that when officials in a province want to reduce the crime rate, the minimum wage should be increased. Therefore, I can say that hypothesis 2 is statistically accepted and stable across the different regressions. My empirical findings suggest that there is an essential correlation between the incidence of crime and the level of poverty alleviation, in terms of income. Consequently, I can say that a distinct conclusion can be drawn for the minimum wage. Though it is correlated, it does not imply that minimum wages cause crime rates. Nevertheless, correlation is often useful for finding causality between the variables. For example, from the previous studies, the income effect also seemed to be an essential factor in people's choices to participate in criminal activity.

To understand the meaning of the statistical results of minimum wages variable, I will try to interpret the value of the Indonesian currency rate in terms of the Euro. A 1000 rupiah is equal to 0.0699 Eurocent (Bloomberg, 2017). For example, in model 5, a 1000-rupiah increase in minimum wages will reduce crime rates by 0.0675 per 100,000 population. If the government wants to reduce crime significantly, they need to increase the minimum wages by 100,000 rupiah, which is equivalent to 6.99 euro. This would reduce crime rates by 6.75 per 100,000 population. It is important to understand the significance of the numbers, in order to know the real effect of any increase in minimum wages granted by the government. I will try to explain by giving an example of how much each currency rate is worth using the Big Mac Index. The price of a Big Mac in Indonesia is 31,000 rupiahs; this means that 100,000 rupiahs will purchase 3 Big Macs. In Europe, the price of one Big Mac is 3.88 euro, which is worth less than 2 Big Mac with 6.99 euro (The Economist, 2017). This shows that prices are lower in Indonesia. But, this should be seen within the context of the fact that the minimum wage in, for example, the Indonesian province of *DKI Jakarta* is about 2,441,000 rupiahs in 2014, which is equivalent to only around 170 euro.

Another interesting point is that crime is not influenced by the standard of living. The relationship is still unclear, whether the standard of living is positively or negatively correlated with crime rates. Moreover, the size of the young male working-age population between 15-24 years old does not explain the crime rate. Lastly, income inequality, presented by Gini coefficients, also does not determine the crime rates. I strongly believe that there are counterintuitive results between crime rates and other economics determinants of crime as I could not distinguish the aggregate crime data.

Testing the core variables, the unemployment rate and minimum wages with different kinds of control variable proves that my results are robust. By performing a number of econometric exercises in this thesis, I found that the minimum wage is the only significant and robust determinant of crime rates. Particularly, the results indicate that there is a significant negative correlation between minimum wages and crime. The government must take action by continuously adjusting the minimum wage in each province to make Indonesia more safe. It is important to note that higher minimum wages could also be the underlying cause of a higher unemployment rate, because they increase the pressure on employers to pay employees more.

The contribution of this paper focuses on policy-making effectiveness in Indonesia, also support the findings from previous literature on the relationship of wages and crime. It may be beneficial for the government to focus on improving labor market conditions and reducing crime by preventing people from committing crimes over a long period of time (Zwienen, 2011).

## **5. Conclusion**

This research discusses the relationship between economic conditions and crime rates in Indonesia. High crime rates may lead to long-term economic problems, and economic conditions in each province can be useful in portraying crime rates. There are many economic variables that can determine crime rates. In this thesis I focused on labor market conditions, represented by the unemployment rate and minimum wages. This paper's main finding is that wages do have a strong relationship with crime rates. The results for minimum wages appear to be consistent across all models, hence providing evidence regarding the research question. The minimum wage has an



effect on wages offered, as it can induce an income effect by causing people to seek other potential sources of income that may be less appropriate.

On the other hand, the OLS results suggest that the crime rate is not sensitive to the unemployment rate. The unemployment rate has an asymmetric relationship with crime. There are numerous possible reasons for this: the use of aggregate crime rates, the use of total unemployment rate, the short-term fluctuations of the unemployment rate, the high degree of informal sector employment in Indonesia, and the fact that employed people can also exhibit criminal behavior.

Many provinces try to eradicate crime in order to gain economic benefits, such as opportunities to build businesses safely. The local governments need to find better options for boosting economic growth and simultaneously lowering crime rates. Other potential solutions could be strengthening the police force and stricter law enforcement as well as creating more job opportunities. Since the distribution of income has a counterintuitive result and the welfare level does not influence crime, increasing the standard of living and reducing inequality do not necessarily reduce crime in Indonesia.

This study considered the relationship between economic performance, especially the labor market, and the crime rate in Indonesia. This thesis proves the existence of a correlation between minimum wages and crime rates. Each province would benefit from higher minimum wages, so this would reduce crime. This paper has strong policy implications for Indonesia as the country's crime rate is still unstable, and labor market performance still needs to be improved. The government of Indonesia would do well to craft better social security programs for its people.

## 5.1 Future research

Further research is needed on a possible causal relationship between the indicators to make a definite argument on causality. Another interesting issue for further investigation is the presence of the hysteresis effect on unemployment. I would recommend that researchers conduct a study on distinguishing between crime data relating to property and data on violent crime in Indonesia, as this is essential for an in-depth analysis, despite the fact that it would be a costly and time-consuming project. Future study should also consider the crime rate of the previous period as another potential determinant of crime. Lastly, recessions and changes in power should be considered as factors that determine crime rates.

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## Appendix

Appendix 1. List of Provinces in Indonesia without *Kalimantan Utara*, *Sulawesi Barat*, and *Papua Barat*

No	Provinces	No	Provinces
1	<i>Aceh</i>	17	<i>Bali</i>
2	<i>Sumatera Utara</i>	18	<i>Nusa Tenggara Barat</i>
3	<i>Sumatera Barat</i>	19	<i>Nusa Tenggara Timur</i>
4	<i>Riau</i>	20	<i>Kalimantan Barat</i>
5	<i>Kepulauan Riau</i>	21	<i>Kalimantan Tengah</i>
6	<i>Jambi</i>	22	<i>Kalimantan Selatan</i>
7	<i>Sumatera Selatan</i>	23	<i>Kalimantan Timur</i>
8	<i>Kepulauan Bangka Belitung</i>	24	<i>Sulawesi Utara</i>
9	<i>Bengkulu</i>	25	<i>Gorontalo</i>
10	<i>Lampung</i>	26	<i>Sulawesi Tengah</i>
11	<i>Metro Jaya</i>	27	<i>Sulawesi Selatan</i>
12	<i>Jawa Barat</i>	28	<i>Sulawesi Tenggara</i>
13	<i>Banten</i>	29	<i>Maluku</i>
14	<i>Jawa Tengah</i>	30	<i>Maluku Utara</i>
15	<i>DI Yogyakarta</i>	31	<i>Papua</i>
16	<i>Jawa Timur</i>		

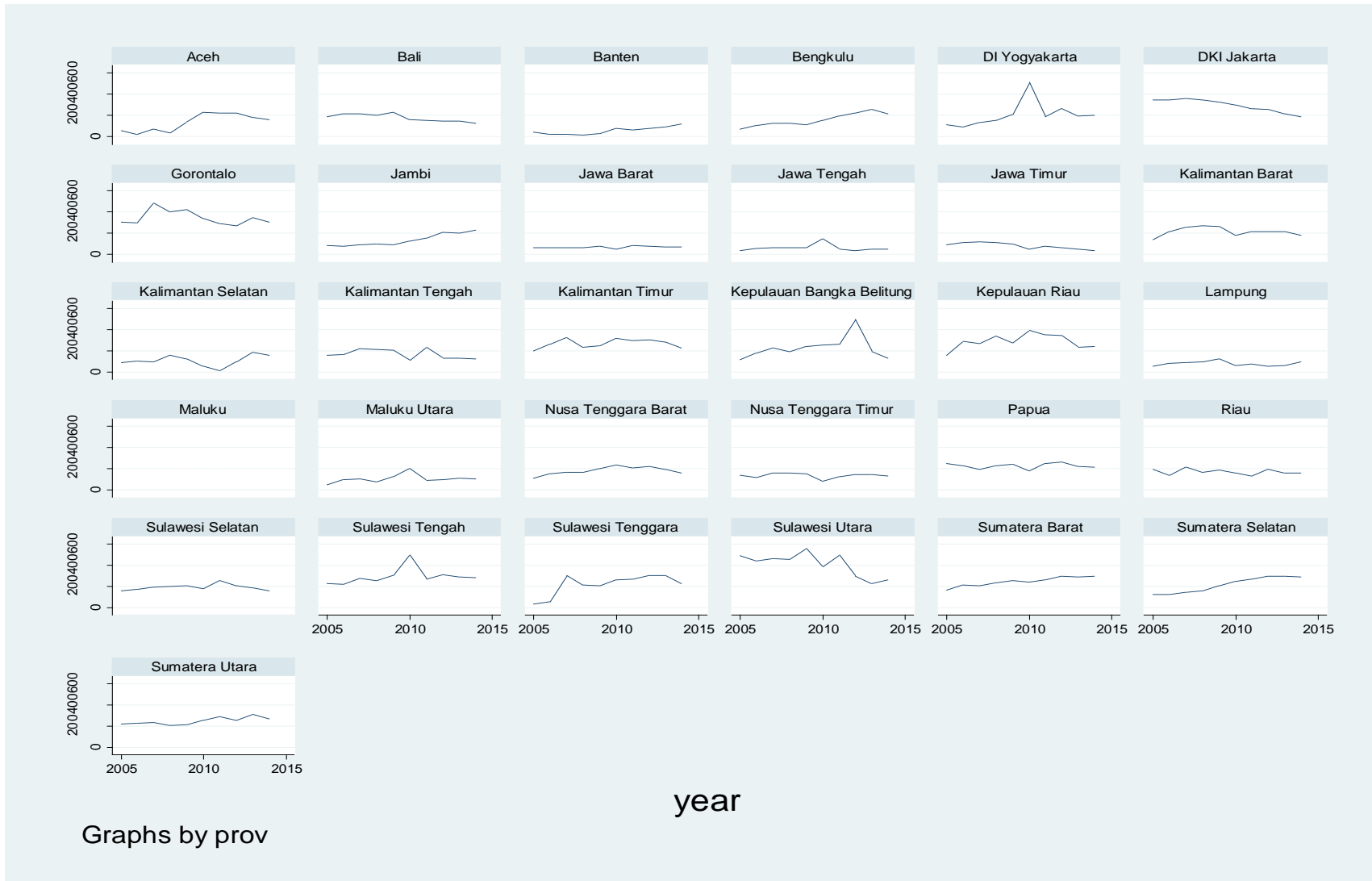
Sources: *Badan Pusat Statistik (BPS)*

## Appendix 2. Political Map of Indonesia



Source: Ezilon Ma

### Appendix 3. Crime Rates in Each Province in Indonesia (31 Provinces from 2005-2014)



Source: *Badan Pusat Statistik (BPS)*

Appendix 4. Multicollinearity Problem Test Using Variance Inflation Factor

Variable	VIF	1/VIF
<i>UnemploymentRate</i>	1.09	0.921329
<i>MinimumWage</i>	3.23	0.309850
<i>YoungMale</i>	1.22	0.817211
<i>MinimumLivingCosts</i>	3.33	0.300479
<i>Gini</i>	1.14	0.878779
Mean VIF	2.00	



Appendix 5. Correlation among Economic Indicators in Combined Provinces

	<i>CrimeRate</i>	<i>UnemploymentRate</i>	<i>MinimumWage</i>	<i>YoungMale</i>	<i>MinimumLivingCosts</i>	<i>Gini</i>
<i>CrimeRate</i>	1.0000					
<i>UnemploymentRate</i>	-0.0479	1.0000				
<i>MinimumWage</i>	0.1171	-0.1494	1.0000			
<i>YoungMale</i>	-0.4554	0.2344	-0.2538	1.0000		
<i>MinimumLivingCosts</i>	0.0942	-0.1608	0.8248	-0.3423	1.0000	
<i>Gini</i>	0.0265	-0.1268	0.2865	0.0773	0.2320	1.0000

Appendix 6. Empirical Findings of Labor Market Performance and Each of the Other Indicators  
on Crime Rates in Indonesia without Both Fixed Effects

	1	2	3	4
<i>UnemploymentRate</i> <sub><i>i,t</i></sub>	-1.160 (2.930)	2.347 (2.863)	-1.176 (2.906)	-1.194 (2.936)
<i>MinimumWage</i> <sub><i>i,t</i></sub>	0.0336** (0.0160)	0.00229 (0.0151)	0.0364 (0.0285)	0.0345* (0.0180)
<i>YoungMale</i> <sub><i>i,t</i></sub>		-0.0524*** (0.00528)		
<i>MinimumLivingCosts</i> <sub><i>i,t</i></sub>			-0.00308 (0.0291)	
<i>Gini</i> <sub><i>i,t</i></sub>				-0.253 (1.821)
Constant	169.9*** (27.79)	216.1*** (25.17)	170.8*** (28.70)	178.4*** (64.50)
Observations	217	217	217	217
<i>R</i> <sup>2</sup>	0.015	0.211	0.015	0.015
Adjusted <i>R</i> <sup>2</sup>	0.005	0.200	0.001	0.001

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The dependent variable is the crime rate. Robust standard error was applied to correct for heteroscedasticity and normality. Standard errors in parentheses. Minimum wages variable after omitting three zeros (000) because of the large numbers that Indonesia's currency rate involves.