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The effect of crime on economic growth

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Table of Contents

1. Introduction

Crime is an act or an instance of negligence that is against the law and punishable upon conviction. A crime against an individual includes any threat of force or the actual use of force against somebody, as well as accidents, which result in death due to an individual's intent or negligence. A crime against property, which can also involve or not violence against a person while committing the crime, includes any attempt or the actual deprivation of somebody's belongings as well as willfully damaging them. Drug offences, impaired driving which resulted in someone's death, arson, betting and possession of weapons as well as the abuse of public office for private or political gain are also crimes which might have an effect on people or property, but do not make part of the above two categories. The damage caused by crime has a significant negative impact on society welfare, which can lead to serious impediments for the creation and maintenance of a developed and well-functioning economy. It imposes large costs to private and public sectors which have a negative impact on personal state-of-being of an individual, as well as on the welfare of the society as a whole. The impact of crime on the economy is substantial, because it generates great costs to society at different levels, from individual to the national one. In the United States, in 2007, there have been more than 23 million crimes committed which resulted in economic losses of nearly 15 billion US dollars to the victims and 179 billion US dollars in government expenditures on legal and judicial activities, police protection and corrections (McCollister et al., 2010). These economic losses present an opportunity cost, because the money spent could yield some tangible and intangible returns if invested with care, therefore it seems reasonable to think that crime has a negative impact on the economic growth of a country (Gaibulloev & Sandler, 2008).

A positive economic growth is imperative for a country, therefore the determinant factors of it have received an increasing attention over the past twenty years. The first theory to stress the role of determinants for the economic growth, which is also the fundamental one, was Solow's growth model (Solow, 1956). It stresses the importance of investments as a determinant for the economic growth. Further research revealed other crucial determinants of the economic growth such as the stock of human capital (Mincer, 1981) and innovation (Aghion & Howitt, 1992). Macroeconomic factors are also essential, but Fischer (1993) stresses the most important ones and presents reasons that they are not sufficient for economic growth. Foreign direct

investment (FDI) is one of the main sources of technology transfer between two countries, which adds relatively more to an economic growth (Borensztein et al., 1998; Lensink & Hermesa, 2003). However, without trade liberalization, which in the majority of the cases leads to FDI (Martens, 2008), the economic growth cannot be sustained. In addition, the credibility of governments plays an important role in openness to trade by diminishing uncertainty and stabilizing it in order to create a greater economic growth (Lensink et al., 1999).

The relationship between crime and economic growth has gained in importance in the academic literature and many tried to estimate what are the direct and indirect costs of crime on the society (McCollister et al., 2010; Anderson, 1999). The amount of studies, which examine this relationship in order to assess the impact of crime on economic progress, is growing. Despite that, the results indicate that a clear conclusion on the association between them has not been defined. Many studies report that crime has a very significant negative influence on economic growth (Cárdenas, 2007; Peri, 2004; Gaibulloev & Sandler, 2008), whereas other conclude that the effect is unclear (Goulas & Zervoyianni, 2012; Burnham et al., 2004) or even absent (Mauro & Carmeci, 2007; Ray et al., 2009).

This paper attempts to add and fill in the gaps to the current crime literature by examining the effect of crime on the economic growth having included a larger set of determinants of growth. The aim of it is to analyze what is the impact of crime on the economic growth when taking into account openness to trade, foreign direct investment and political environment all together, after controlling for variables which are typically included in growth regressions. The model used will try to answer to the following *research question:*

"What is the effect of crime on economic growth?"

The data used in this research is going to be retrieved from the following databases: Eurostat, UNCTADSTAT and World Bank. Crime data represents any illegal activity crime recorded by the police, which includes homicide, violent crime, robbery and domestic burglary. The rest of the variables are as described. All the data will be collected for countries from European Union for a 9 year period from 2004 to 2012 which is the latest available period. To find the effect of crime on economic growth, I first check whether crime correlates with other control variables such openness to trade. Where this is the case, I remove the crime component

from those of control by orthogonalizing these variables individually. More specifically, I perform new regressions where I regress each control on crime variable and take the error term of these regressions as the new proxy for the corresponding determinants. For example, if openness to trade correlates with crime, I regress openness to trade on crime. The error term from this regression is the new proxy for openness to trade which is not contaminated by the information content in the crime variable. In the end of this study I hope to be able to explain the magnitude of the effect of crime on the economic growth, depending on the type of crime.

2. Literature review

In this section the literature concerning determinants of economic growth and their importance will be presented. Moreover, an overview of different aspects of crime will be given and the literature concerning the costs incurred to an economy due crime on personal and aggregate levels will be discussed. Subsequently, the literature which shows the possible association of crime with different determinants of economic growth will be analyzed. To elaborate on the potential relation of crime with economic growth in the case of this thesis, the main findings of the papers discussed will be highlighted and the most relevant and noteworthy theoretical aspects will result into development of hypotheses.

2.1 Determinants of economic growth

A positive economic growth is imperative for the development of a country, therefore the determinant factors of it have to be stressed. The first theory to stress the role of determinants for the economic growth, which is also the fundamental one, was Solow's growth model (Solow, 1956). It emphasizes the role of capital stock, which is the summation of previous investments into machines and buildings, in the short-run economic growth. It manages to deepen the apprehension of economic growth partially, because it regards the technological progress as exogenous to the economic model. This model predicts that, due to convergence in growth rates, poor economies grow faster compared to the rich ones. As the technological progress was the main reason why the Solow growth model is only partially explained, it would be proper to analyze its role in the economic growth. Technological change is a consequence of a conscious investment undertaken by agents seeking maximizing their profits. The first to develop the theory of "Creative destruction" was Schumpeter (Library of Economics and Liberty, 2008). He

argued that innovation causes old technology, skills, ideas, and equipment to become obsolete and by this, it grounds further improvement in technology and a continuous progress (Library of Economics and Liberty, 2008). The next to elaborate on Schumpeter's idea were Aghion and Howitt (Aghion & Howitt, 1992) which combined the ideas of creative destruction and the patent race. A patent race, according to Jensen (2009), is a competition which involves multiple inventors, usually companies, who compete to discover an innovation first and then patent it in order to secure it from imitation. They conclude that firms are motivated to innovate, because they expect to have abnormal profits due to becoming monopolies. The chance of consequent innovation to be discovered discourages present research due to potential loss of profits created by current innovation (Aghion & Howitt, 1992). Nevertheless, it is argued that competition results in companies over-investing in research (Jensen, 2009) which results in a greater use of technology that enables the development of new and superior processes and products and a faster acceleration of economic progress.

The stock of human capital is regarded as crucial to the economic growth and the first to mention this was Mincer (1981). In his paper the author showed that the acquired abilities of individuals are the ones which have an impact on economic growth. Together with the increase in the physical capital, they create the framework of aggregate production function, and yield a higher economic growth (Mincer, 1981). Accumulation of individual human capital which refers to worker's acquisition of knowledge by acquiring skills and know-how through education and training (Mincer, 1981) generates personal economic growth. The aggregation of personal human capital on a national level yields the growth of an economy. The bigger the number of contributors, the higher the growth is. The author concluded that the relationship between the growth of human capital and the economic growth is interrelated, the stock of human capital being a condition and a consequence of economic growth (Mincer, 1981). Foreign direct investment (FDI) is a source of technology transfer between two countries, which adds relatively more to an economic growth, therefore this determinant is considered to be of a great importance as well (Borensztein et al., 1998) However it is highly dependent on assimilation potential of the stock of human capital of the economy which receives the inflows of FDI (Borensztein et al., 1998; Lensink & Hermesa, 2003).

Openness to trade is another imperative determinant of economic growth. It is measured by dividing the sum of imports and exports of goods and services to GDP and it has an effect on economic growth by increasing the competitive advantage. The industries develop attributes that help them to distinguish themselves and surpass the competitors. Companies in the meanwhile are motivated to become more competitive within the industries. Moreover trade enhances the transfer of knowledge and technology. Also, by opening the economy to the external world it helps to increase the economies of scale[1]. Kraay and Dollar (2004) analyze the relationship between openness to trade and economic growth and conclude that developing countries benefit the most from opening their economies to external world, by having an increase in GDP per capita[2] growth of 5.0 %. Consequently developed countries had an increase of 2.2% and countries which were closed to trade had an increase of only 1.4% (Kraay & Dollar, 2004).

Political stability has been proven to be an important component leading to economic growth. The lower the political stability, the higher the uncertainty is which in turn causes deterrence of investments. In the end it results in a hampered economic growth. Lensink et al. (1999) provide some empirical evidence on political environment having a great significance in economic growth. In their paper they conclude that credibility of governments enhances the economic progress by diminishing uncertainty, moreover the implementation of policies which stabilize trade aid to the creation of a greater economic growth (Lensink et al., 1999).

In this paper, crime is studied as a cause and not a consequence of the economic growth. Therefore the decision to investigate the above-mentioned factors was taken due that they might be influenced by crime and less the other way around. Crime has an impending negative effect on human and capital stock, which are the crucial economic determinants, because it decreases both the tangible and intangible welfare of individuals and of the societies as a whole (Anderson, 1999; McCollister et al., 2010). As previously mentioned, technological change and FDI inflow are highly dependent on human and capital stock, therefore the impact of crime on the later group of determinants expands to first set as well, which in turn has an aggregate effect on economic growth. Moreover, crime has a direct effect on FDI inflows acting as a deterrent for foreign investors (Daniele & Marani, 2011; Gaibulloev & Sandler, 2008) Crime also affects

[1] Economies of scale help to cut the average costs of a product, by increasing the output of that product.
[2] GDP per capita is a measure of the total output of a country that takes the gross domestic product (GDP) and divides it by the number of people in the country (http://www.investopedia.com/, 22 June 2014).

openness to trade. Governments are first of all concerned of their human capital and before engaging in trade, one government would seek for countries where their trading agents would be relatively safe. Therefore high crime rates might constrain the effect of openness to trade, by generating a price mark-up similar to a hidden tax (Marcouiller et al., 2002). Another economic determinant which is negatively influenced by crime is political stability. In countries with high crime rates, people are very concerned about their safety and they seek for the government to be effective in this sense. When governments fail to decrease the crime rates, political stability is decreasing because citizens lose faith and demand other governance. Opposite to the previous factors, economic determinants such as welfare inequality, institutions which influence the economic performance, socio-cultural factors, geographic location and the demographic trends tend to have an influence on crime. Poverty arises due to income inequality, thus induces the crime rates to grow. Institutions which are not competent or tend to tolerate corruption, fail to govern correctly and stimulate the crime rates to rise. Socio-cultural factors are deeply rooted into a nation's culture, therefore crime might be a consequence of a culture and less the other way around. Geographic location and demographic trends might also affect crime due migration, age distribution and population density. The study of determinants which affect crime, is beyond the scope of this thesis. By analyzing the correct factors, an objective answer to how does crime affect the economic growth will be given.

2.2 The costs of crime

Crime is an act or an instance of negligence that is against the law and punishable upon conviction. Crime comprises a broad spectrum of characteristics, because it is a complex socio-economic phenomenon and it can be committed by an individual or a group of people, just as the impact of it can affect either a person or a group of people. A crime against an individual includes any threat of force or the actual use of force against somebody, as well as accidents, which result in death due to an individual's intent or negligence. A crime against property, which can also involve or not violence against a person while committing the crime, includes any attempt or the actual deprivation of somebody's belongings as well as willfully damaging them. Drug offences, impaired driving which resulted in someone's death, arson, betting and possession of weapons as well as the abuse of public office for private or political gain are also

crimes which might have an effect on people or property, but do not make part of the above two categories.

The economic losses due to criminal activities have captured a lot of attention from academia. Anderson (1999) attempts to evaluate the aggregate burden of crime, which is the total annual cost of criminal behavior in the US. The values are adjusted to correspond with the Consumer Price Index[3] of the year 1997. The aim of Andersons' study is to give an insight upon the aggregate costs which stretch beyond tangible costs and include the intangible ones such as opportunity costs. The author concludes that the approximated value of tangible economic losses is 603 billion US dollars (Anderson, 1999). In addition, these costs generate an excess of another 1,102 billion US dollars in economic losses due to lost productivity, crime-related expenses and diminished quality of life (Anderson, 1999). In total the aggregate burden of crime is 1,705 billion US dollars. Compared to other numbers such as insurance purchases which account for 1,680 billion US dollars, the outstanding mortgage debt to commercial banks and savings institution which account for 1,853 billion US dollars and annual health expenditures which account for 1,038 billion US dollars, the costs of crime represent a very high share of the total costs incurred by the US economy (Anderson, 1999).

A further step was made by McCollister et al. (2010) who measure the tangible and intangible economic losses per criminal offense. The authors mention a considerable number of studies that were done in order to develop crime-costing methods which try to measure those costs. In their paper, they perform calculations in order to evaluate the per-offense tangible and intangible costs, as well as total per-offense costs. They conclude that the average costs of a murder are 8,982,907 US dollars, of a rape/sexual assault are 240,776 US dollars, of robbery are 42,310 US dollars, of a household burglary are 6462 US dollars and of stolen property are 7974 US dollars, values converted for the year 2008 (McCollister et al., 2010). Moreover, they evaluate that the costs due crime incurred by the United States, in 2007, were of nearly 15 billion US dollars to the victims and 179 billion US dollars in government expenditures on legal and judicial activities, police protection and corrections (McCollister et al., 2010).

[3] Consumer Price Index (CPI) is a measure that examines the weighted average of prices of a basket of consumer goods and services, such as transportation, food and medical care (http://www.investopedia.com/, 22 June 2014).

The harm caused by crime has a significant impact on society which results into drawbacks for the economy. It imposes large costs to private and public sectors which have a negative impact on personal state-of-being of an individual as well as on the welfare of the society as a whole. The impact of crime on the economy is substantial because it generates great tangible and intangible costs to society at different levels, from individual to the national one. The amount of money lost due crime presents a great economic loss to an economy, which otherwise could have been used in other perspectives. The opportunity cost of crime, the benefit one could have obtained by taking an alternative action, is an investment which could have yielded some tangible and intangible positive returns if invested with care, thus it seems reasonable to assume that crime has a negative impact on the economic growth of a country and that the study of this issue is of a great importance.

2.3 The relationship between crime and economic growth

Academia attempts to step further by studying on which of the determinants of economic growth, crime has the biggest impact. In an empirical research which aimed to find out the reasons of deceleration of Colombia's economic growth, the retardation of growth started in 1980, Cardenas (2007) observed that physical and human capital accumulation had no effect on the decrease of economic progress and the only cause of it was productivity loss. When exploring further the reasons of productivity loss, the author observed that this was due to increasing levels of crime, specifically homicide rates due to increasing drug-trafficking capacity (Cárdenas, 2007). The author concluded that the increase in crime rate have a significant negative impact on the economic growth. Another study, conducted by Peri (2004), tests the effects of socio-cultural variables, such as civic involvement of its citizens and presence of organized crime as revealed by murder rates, on the economic success of Italian provinces using data from 95 provinces over the period from 1951 to 1991. The author concludes that civic involvement does not have a clear impact on economic progress, but crime does have a significant effect on reducing per capita income and employment growth (Peri, 2004). As mentioned earlier, the costs of crime present an opportunity cost and Gaibulloev and Sandler (2008) confirm it by exploring the effect of crime from transnational and domestic terrorism perspective on the economic progress of 18 Western European countries, using data from 1971 to 2004. They conclude that terrorism crowds-out growth-enhancing monetary inflows, such as

foreign direct investment (FDI), and in addition to that, it increments growth-neutral government spending which could have otherwise be used to stimulate the economic growth (Gaibulloev & Sandler, 2008).

Opposite to univocal studies which showed that crime indeed has a negative effect on economic growth, there are observations which show a vague relationship between these two factors. Goulas and Zervoyianni (2012) check the effect of the interaction of crime and macroeconomic uncertainty on economic growth using a panel of 25 countries over the period 1991 to 2007. The authors conclude that the increasing levels of crime do not have an independent effect on economic growth under favorable economic conditions, but are highly significant in bad economic times, i.e. when worsening the economic conditions. (Goulas & Zervoyianni, 2012). Burnham et al. (2004) examine the link between inner-city crime patterns and suburban income growth using data on metropolitan areas of 32 US states from 1982 to 1997. Their results show that the bigger the distance from the central city, the lower the negative effect of crime is, and at a certain point the impact even becomes positive (Burnham et al., 2004). They conclude that crime has no clear effect on growth.

Nevertheless, some authors argue that crime has no effect on economic growth. Mauro and Carmeci (2007) explore the associations between crime, measured in homicides, unemployment and long-run economic growth, using annual data for 19 Italian regions over the period 1963 to 1995. Their observations show that crime has no significant impact on long-run growth even though it has a significant negative effect on income levels (Mauro & Carmeci, 2007). Ray et al. (2009) analyze the relationship between crime and corruption and economic growth using data sets from International Crime Victim Surveys for both European Union (EU) and non-EU countries over the period 1989-2005. They conclude that there is no strong evidence of any significant link between crime and growth rates.

It can be noticed that the relationship between crime and economic growth is a growing concern and the interest for it is increasing. The amount of studies, which examine this relationship in order to assess the impact of crime on economic progress, is growing. Despite that, the results indicate that a clear conclusion on the association between them has not been defined. Many studies report that crime has a very significant negative influence on economic growth (Cárdenas, 2007; Peri, 2004; Gaibulloev & Sandler, 2008), whereas other conclude that

the effect is unclear (Goulas & Zervoyianni, 2012; Burnham et al., 2004) or even absent (Mauro & Carmeci, 2007; Ray et al., 2009).

Based on afore-mentioned theoretical arguments, some hypotheses will be constructed with respect to the effect of crime on economic growth in the EU countries. An enforcement of the importance of determinants, such as physical and human capital accumulation, is presented by Mankiw et al. (1992) in an augmented Solow model that incorporates both of the afore-mentioned factors, represented through saving as a rate of GDP, education through tertiary enrolment[4] and population growth. The model shows that 80% of the cross-country differences in economic growth can be explained by this augmented model (Mankiw et al., 1992). In addition, the technological progress was the cause of the partial explanation of the Solow growth model, therefore along with physical and human capital accumulation, will be included as control variables when analyzing data between countries from European Union. The first hypothesis is the following:

Hypothesis 1: Total crime has a statistically significant negative impact on economic growth when included in the augmented Solow growth model adjusted to technological progress.

Foreign direct investment (FDI) is one of the main sources of technology transfer between two countries, which adds relatively more to an economic growth. However, without trade liberalization, which in the majority of the cases leads to FDI (Martens, 2008), the economic growth cannot be sustained. In addition the credibility of governments plays an important role in openness to trade by diminishing uncertainty and stabilizing it in order to create a greater economic growth (Lensink et al., 1999). In order to deepen the apprehension of the effect of crime on the economic growth, the afore-mentioned determinants will be included in the regression model. The second hypothesis is the following:

Hypothesis 2: Total crime has a statistically significant negative impact on economic growth.

In their paper, Goulas and Zervoyianni (2012), analyzed the effect of crime on economic growth taking the sum of all the reported number of crime offenses such as robberies, thefts,

[4] According to the Organization for Economic co-operation and Development (OECD), most of the European countries are ranked as developed, therefore the decision to use the data for tertiary, instead of secondary, enrollment was taken. Tertiary education is represented as the gross enrolment ratio which is the rate of high school graduates that have enrolled into a university.

burglaries, rapes, assaults and completed intentional homicides. One might argue that taking the aggregate number of total crime cannot assess the effect of crime objectively, because the impact a homicides has on an economy, cannot be compared to the impact of a robbery or a domestic burglary (McCollister et al., 2010). Therefore the decision to investigate the types of crime separately was taken. The third hypothesis is the following:

Hypothesis 3: The magnitude of the impact of crime on the economic growth depends on the type of crime.

3. Data

This section comes to describe the variables used in this thesis. In the appendix, Table 1 exhibits the summary statistics of the variables. This thesis looks into the effect of crime on economic growth within the EU-27 countries between the years 2004 and 2012, the list of the countries can be found in Table 2 in the appendix. The data set is composed of balanced panel of annual observations, i.e. it contains all components observed for all the years, missing observations being infrequent.

3.1 The dependent variable

Economic Growth is the dependent variable and it is defined as *GDP per capita growth.* Gross domestic product (GDP) is the pecuniary value of all the finished goods and services produced by all the resident producers within the borders of a country, usually computed on an annual basis, and which includes any product taxes and excludes the subsidies in the value of the goods (The World Bank Group, 2014). GDP per capita growth is the annual percentage growth rate of GDP per capita, GDP per capita being the total output of a country that takes the gross domestic product (GDP) and divides it by the midyear number of people in the country (The World Bank Group, 2014). The data is retrieved from *The World Bank* database (The World Bank Group, 2014) which is considered a reliable one and which provides a large number of observations for a large set of countries, over a vast period of time. 243 observations were obtained, 9 observations for each country.

3.2 The independent variables

Ln(TotalCrime) is the independent variable and it is computed as the natural logarithm of total number of crimes recorded by the police. *In order to test the first two hypotheses,* according to the study of Goulas and Zervoyianni (2012) data on *Total Crime* is going to be used, but due to relatively high numbers in the crime data, the variables will be logarithmized. The natural logarithm (Ln) transformation is used in order to reduce the fluctuations, make the pattern of ***Total Crime*** variable more interpretable and be able to reach conclusions that broaden beyond the data itself. Moreover, the variable is transformed in order to normalize the residuals. Using the Ln, the initial variable is replaced in order to change the configuration of a distribution. Each data point of the variable ***Total Crime*** is replaced with the transformed value ***Ln(TotalCrime)***, where logarithm to base *n* (Ln) express the base of an irrational number *e*, which has an approximate value of 2.7183. The initial values are replaced as the power to which *e* (2.7183) would have to be raised in order to be equal. *In order to test the third hypothesis data on different types of crime is necessary.* According to (McCollister et al., 2010) the costs of each type of crime are different, therefore it is assumed that the magnitude of the impact of each type of crime on the economic growth vary as well. *As a result* ***Ln(Homicide), Ln(ViolentCrime), Ln(Robbery) and Ln(DomesticBurglary)*** *variables will be used as independent.* Due to relatively high numbers and the necessity to normalize the residuals, the data on each of the variables is logaritmized as well. First, the data on ***Ln(Homicide)*** is going to be used. It is depicted as crime against an individual which resulted in death due to an individual's intent or negligence and it is expected to have the biggest impact on economic growth. Second, the data on ***Ln(ViolentCrime)*** is going to be tested. It is also defined as crime against an individual which includes any threat of force or the actual use of force against somebody, as well as accidents. This variable is expected to have a lower negative effect on economic growth than the homicides variable, but still statistically significant. The last types of crime tested will be ***Ln(Robbery) and Ln(DomesticBurglary)***. These variables are defined as crimes against an individual or a property, which can also involve or not violence against a person while committing the crime, and include any attempt or the actual deprivation of somebody's belongings as well as willfully damaging them. These variables are expected to be statistically significant. All the data on crime is expressed in units and it was retrieved from the Eurostat database. The amount of observations

differ from case to case, having 234 observations on total crime, 243 on homicide, 241 on violent crime, 243 on robbery and 241 on domestic burglary.

3.3 Control variables

Economic growth consists of a number of determinants, which were distinguished by former studies and will be used as control variables. It is expected that crime will affect the economic growth by having an impact on its determinants. A short description on each of the determinants is provided below:

Savings, depicted as savings as a rate of GDP, represents the capital stock. It is the summation of previous investments into machines and buildings in the short-run economic growth. According to Goulas and Zervoyianni (2012) it is defined as gross capital formation as a percentage of GDP and it is a term to describe the capital accumulation. Crime is expected to decrease the savings rate, due to the fact that it imposes additional costs to the economy (Anderson, 1999). This may in turn decrease the economic growth, because the money which could have been used for capital accumulation, have to be used to cover crime expenses. The data has been retrieved from *The World Bank* database (The World Bank Group, 2014). It is important to mention that the outliers have been removed in order to normalize the residuals. For instance countries such as Latvia and Estonia have high savings in years 2006 and 2007. These countries saved a lot in order to accommodate the strong market growth after being integrated in the European Union in 2004 (European Economic and Social Committee, 2013).

Education is defined as tertiary education for both sexes and it is represented as the gross enrolment ratio which is the rate of high school graduates, regardless of age, that have enrolled into a university. It is expressed as a percentage of the total population. According to the Organization for Economic co-operation and Development (OECD), most of the European countries are ranked as developed, therefore the decision to use the data for tertiary, instead of secondary, enrollment was taken. Moreover, Goulas and Zervoyianni (2012) which used the same set of countries, also use the ratio of gross tertiary enrolment. Education is expected to decrease crime, since people which are educated are assumed to perceive crime as an opportunity cost, thus increase the economic growth. The data was obtained from *The World Bank* (The World Bank Group, 2014). This variable has also been subjected to the removal of outliers,

Luxembourg having unusual low enrolment rates for years 2007 to 2009 and Greece having the highest enrolment rates out of all the dataset in 2011.

Population Growth is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage and the data for this control variable was retrieved from *The World Bank* (The World Bank Group, 2014). In addition to the fact that it is a determinant of economic growth, and that the data on crime is not expressed in rates but in units, population growth expressed as a percentage was included to the model. Homicides decrease the population growth directly, whereas other types of crime are expected to decrease it indirectly by limiting the moral and financial capabilities, resulting into a hampered economic growth.

Technological Change is represented through high-technology exports, products with high research and development intensity, which are measured as a percentage of manufactured exports (The World Bank Group, 2014). It seems reasonable to include this control variable into the model, because crime affects the savings rate of an economy reducing the share of financial resources available for the accumulation of human and capital stock. As a consequence the technological progress stagnates as well which in turn has a negative effect on economic growth. The data has been obtained from *The World Bank* (The World Bank Group, 2014). This variable has been subjected to the removal of outliers as well. The most outliers have been caused by Malta, where all the values for all the years had to be removed. During the period from 1990 to 2011, on average the high-tech exports were of 55.6 % of all the manufactured exports, reaching the peak in 2000 where the percentage was of 71.74 (TheGlobalEconomy, 2014) Moreover, in order to normalize the residuals the natural logarithm of this variable was taken.

FDI inflow is defined as foreign direct investment (FDI) inflows and is computed as a percentage of gross domestic product (GDP). These are investments received at home from foreign investors. According to Borensztein (Borensztein et al., 1998) FDI is a source of technology transfer between two countries, which adds relatively more to an economic growth. As previously mentioned, crime affects the human capital stock, thus affects the stock of human capital ability to assimilate the FDI investments (Borensztein et al., 1998; Lensink & Hermesa, 2003). As a result, this has a negative impact on economic growth. The data was obtained from the United Nations conference on trade and development (UNCTADSTAT) database. In this dataset, the most outliers have been detected and removed. First of all, Luxembourg is

responsible for a significant amount of outliers, because it is a leader in terms of overall market openness in European Union (LuxembourgforFinance, 2013). Bulgaria also had a couple of unusual high FDI inflows in the years 2006 to 2008. This might be a consequence of its integration to the European Union. In addition, in order to normalize the residuals, it has been transformed thus all the values are positive and then the natural logarithm of this variable was taken.

Openness to Trade is defined as trade, which is the sum of imports and exports of goods and services, and it is computed as a percentage of GDP (The World Bank Group, 2014). Crime is expected to decrease the quantity of goods and services traded, due to lowering the available human and financial resources for manufacturing the products. As a result this will have a negative effect of the economic growth. The data on trade has been retrieved from *The World Bank* (The World Bank Group, 2014). In this variable, the outliers were caused solely by Luxembourg. Data for all the years has been removed for this country, because this is one of the most open to trade countries in European Union being ranked as number 3 by the International Chamber of Commerce in the Open Markets Index (OMI) (LuxembourgforFinance, 2013)

Political Stability, depicted as political stability and absence of violence/terrorism, captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism (The World Bank Group, 2014). The data is represented in units of standard normal distribution, as scores on the aggregate indicator, ranging from -2.5, very politically unstable, to 2.5, politically very stable (The World Bank Group, 2014). Increasing crime is expected to negatively influence political stability, due to decreasing credibility of the citizens. This in turn would result to a lower support for the governance and a hampered economic growth. The data was obtained from *The World Bank* (The World Bank Group, 2014).

4. Methodology

This thesis intends to investigate the effect of crime on economic growth in a fixed effects panel model. In order to ensure that the error term of the independent variable is not correlated with the error terms of other control variables and that the coefficients are independent, according to the causality testing framework for panel data of Reichert and

Weinhold (2001), orthogonalization is necessary. This allows the estimated variances of the coefficients to be appropriately interpreted. Ordinary least squares method (OLS) is going to be used to test the three hypotheses. OLS is a method used in statistics that estimates the unknown parameters in a linear regression model and which has the following expression:

$$y = \alpha + \beta * x + e$$

where y is the dependent variable, x is the independent variable, α and β are the unknown parameters, α being also the constant term, and e is the error term. To find the effect of crime on economic growth, first is checked whether crime correlates with other control variables. A Pearson correlation analysis is performed in order to check statistically significant linear relationships between the variables or simply speaking it is done in order to find whether two explanatory variables are measures of the same thing. If that happens to be true and variables are indeed highly correlated, meaning that one variable can linearly predict the other, then the variables have to be orthogonalized, otherwise the effect of each of the independent variable is not clear. It is important to mention that the threshold of the minimum value of correlation coefficient is 0.4, which is the lower bound of moderate strength correlation. Therefore all the values which are below this strength of correlation will not be subjected to orthogonalization. Artificial orthogonalization is a statistical method where the correlated predictor variables are substituted by a smaller number of artificial, but orthogonal variables (McCallum, 1970). The new variables do not contain the information implied by the independent variable on which they were regressed, therefore it can result in better estimation of parameters of the original regression model (McCallum, 1970; Love & Zicchino, 2006). More specifically, new regressions are performed where each control variable is regressed on crime variable and the error term of these regressions is taken as the new proxy for the corresponding determinants. This can be expressed using the following formulas:

$$y = \alpha + \beta_1 * x + \beta_2 * z + e$$

where z is the control variable and β_2 the unknown parameter, ceteris paribus; consequently

$$z = \alpha + \beta * x + e$$

which results to

$$\tilde{z} < z$$

where z is the control variable, x is the independent variable, specifically the crime variable, and $\tilde{z}$ is the error term which is taken as a new proxy for the corresponding determinant, ceteris paribus. To illustrate that, if openness to trade correlates with crime, openness to trade is regressed on crime. The error term from this regression is the new proxy for openness to trade which is not contaminated by the information content in the crime variable. In the end, the hypotheses are tested using the regressions with relevant variables:

$$y = \alpha + \beta_1 * x + \beta_2 * \tilde{z} + e$$

Before testing the first hypothesis, a couple of regressions will be performed in order to check the relationship between the dependent variable, the independent ones and the control variables. It is expected that the first set of control variables, specifically the ones which will be used to test the first hypothesis, to be of a major importance, therefore it is crucial to investigate how the independent and the control variables interact with each other. First the dependent variable will be regressed with the independent one, consequently adding one by one the control variables. The afore-mentioned actions are expressed below:

$$1)\ Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Total\ Crime_{i,t}} + e$$

$$2)\ Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Total\ Crime_{i,t}} + \beta_2 * Population\ Growth_{i,t} + e$$

$$3)\ Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Total\ Crime_{i,t}} + \beta_2 * Population\ Growth_{i,t} + \\ + \beta_3 * Savings_{i,t} + e$$

$$4)\ Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Total\ Crime_{i,t}} + \beta_2 * Population\ Growth_{i,t} + \beta_3 * Savings_{i,t} + \\ + \beta_4 * Education_{i,t} + e$$

$$5)\ Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Total\ Crime_{i,t}} + \beta_2 * Population\ Growth_{i,t} + \beta_3 * Savings_{i,t} + \\ + \beta_4 * Education_{i,t} + \beta_5 * Technological\ Change_{i,t} + e$$

The indices for country and year are represented via $i\ (1, \dots, 27)$ and $t\ (2004, \dots, 2012)$ respectively and e being the error term. In order to test the first hypothesis, the first step is to perform a Pearson correlation analysis. If the correlation between the independent and control variables is observed, then the control variable which is correlated with the independent variable is orthogonalized. If no correlation is observed then no orthogonalization is performed. The second step is to perform a regression without the independent variable. The regression including

the independent variable has been already tested in regression number 5, therefore we go straight to checking the effect of the Total Crime variable on the Economic Growth. The hypothesis will be tested using the following models:

5) $$Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Total\ Crime_{i,t}} + \beta_2 * Population\ Growth_{i,t} + \beta_3 * Savings_{i,t} + + \beta_4 * Education_{i,t} + \beta_5 * Technological\ Change_{i,t} + e$$

6) $$Economic\ growth_{i,t} = \alpha + \beta_1 * Population\ Growth_{i,t} + \beta_2 * Savings_{i,t} + \beta_3 * Education_{i,t} + + \beta_4 * Technological\ Change_{i,t} + e$$

The second hypothesis is going to be tested following the same principles as the first one, but adding some more control variables in order to achieve a complete model of economic growth which will include the full set of variables. The models which are going to be used are the following:

7) $$Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Total\ Crime_{i,t}} + \beta_2 * Population\ Growth_{i,t} + \beta_3 * Savings_{i,t} + + \beta_4 * Education_{i,t} + \beta_5 * Technological\ Change_{i,t} + \beta_6 * FDI\ inflow_{i,t} + e$$

8) $$Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Total\ Crime_{i,t}} + \beta_2 * Population\ Growth_{i,t} + \beta_3 * Savings_{i,t} + + \beta_4 * Education_{i,t} + \beta_5 * Technological\ Change_{i,t} + \beta_6 * FDI\ inflow_{i,t} + + \beta_7 * Openness\ to\ Trade + e$$

9) $$Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Total\ Crime_{i,t}} + \beta_2 * Population\ Growth_{i,t} + \beta_3 * Savings_{i,t} + + \beta_4 * Education_{i,t} + \beta_5 * Technological\ Change_{i,t} + \beta_6 * FDI\ inflow_{i,t} + + \beta_7 * Openness\ to\ Trade + \beta_8 * Political\ Stability_{i,t} + e$$

10) $$Economic\ growth_{i,t} = \alpha + \beta_1 * Population\ Growth_{i,t} + \beta_2 * Savings_{i,t} + \beta_3 * Education_{i,t} + + \beta_4 * Technological\ Change_{i,t} + \beta_5 * FDI\ inflow_{i,t} + + \beta_6 * Openness\ to\ Trade + \beta_7 * Political\ Stability_{i,t} + e$$

The third hypothesis is going to be tested using the full set of control variables, but the independent variable is going to be split in several types of crime, specifically homicide, violent crime, robbery and domestic burglary. It is assumed that the independent variable, *Total Crime*, used in the first two hypotheses, is composed of the four above-mentioned types of crime. By testing the third hypothesis, it is expected to investigate the magnitude of the impact of *Crime* on

Economic Growth. New regressions will be performed for each type of crime where all the control variables will be included. The following models will be used:

11) $$Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Homicide_{i,t}} + \beta_2 * Savings_{i,t} + \beta_3 * Education_{i,t} + \\ + \beta_4 * Population\ Growth_{i,t} + \beta_5 * Technological\ Change_{i,t} + \\ + \beta_6 * FDI\ inflow_{i,t} + \beta_7 * Openness\ to\ Trade + \beta_8 * Political\ Stability_{i,t} + e$$

12) $$Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Violent\ Crime_{i,t}} + \beta_2 * Savings_{i,t} + \beta_3 * Education_{i,t} + \\ + \beta_4 * Population\ Growth_{i,t} + \beta_5 * Technological\ Change_{i,t} + \\ + \beta_6 * FDI\ inflow_{i,t} + \beta_7 * Openness\ to\ Trade + \beta_8 * Political\ Stability_{i,t} + e$$

13) $$Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Robbery_{i,t}} + \beta_2 * Savings_{i,t} + \beta_3 * Education_{i,t} + \\ + \beta_4 * Population\ Growth_{i,t} + \beta_5 * Technological\ Change_{i,t} + \\ + \beta_6 * FDI\ inflow_{i,t} + \beta_7 * Openness\ to\ Trade + \beta_8 * Political\ Stability_{i,t} + e$$

14) $$Economic\ growth_{i,t} = \alpha + \boldsymbol{\beta_1} * \boldsymbol{Domestic\ burglary_{i,t}} + \beta_2 * Savings_{i,t} + \beta_3 * Education_{i,t} + \\ + \beta_4 * Population\ Growth_{i,t} + \beta_5 * Technological\ Change_{i,t} + \\ + \beta_6 * FDI\ inflow_{i,t} + \beta_7 * Openness\ to\ Trade + \beta_8 * Political\ Stability_{i,t} + e$$

5. Results

In order to observe the variables which have to be orthogonalized, first a Pearson correlation analysis was done. As mentioned in the methodology section, orthogonalization is done only if a certain correlation coefficient has a value of 0.4 and higher, 0.4 being the lower bound of moderate strength correlation and which is the threshold of the minimum value of correlation coefficient. In Table 3 it can be seen that absolutely all the independent variables, all types of crime, are correlated with the *Openness to Trade* variable. It seems reasonable to think that there is a linear relationship between these two variables, since high crime rates generate a price mark-up similar to a hidden tax, thus constrain the effect of openness to trade (Marcouiller et al., 2002). Interestingly, correlations between *LnHomicide* and *LnDomesticBurglary* and *Political Stability* can be noticed, whereas there is no correlation between *LnTotalCrime* and *Political Stability*. It seems reasonable to think that homicides, of all crime, have the biggest impact on a society when committed, because people blame the government for the lack of security provided, therefore this justifies the correlation between *LnHomicide* and *Political Stability*. Moreover the correlation between *LnDomesticBurglary* and *Political Stability* also

seems to be justifiable. It is assumed that people feel relatively the safest at home, therefore domestic burglary is a direct threat for personal safety. As a result, this is a threat for political stability due to same reasons as with *LnHomicide*. The highlighted values in the table are higher than 0.4, therefore new regressions were performed where each of the control variables was regressed on the independent variable and the error terms of those regressions were taken as the new proxies for the corresponding determinants.

Table 3. Pearson correlations

	Savings	**Education**	**Population Growth**	**Technological Change**	**FDI inflow**	**Openness to Trade**	**Political Stability**	**Economic Growth**
LnTotalCrime	-0.228***	0.270***	0.036	0.241***	-0.344***	-0.524***	-0.192***	-0.115*
LnHomicide	0.033	0.169**	-0.337***	-0.003	-0.223***	-0.535***	-0.518***	0.085
LnViolentCrime	-0.224***	0.218***	0.123	-0.343***	-0.277***	-0.430***	-0.137**	-0.135**
LnRobbery	-0.165**	0.156**	-0.03	0.1	-0.284***	-0.542***	-0.349***	-0.088
LnDomestic Burglary	-0.243***	0.125	0.049	0.277***	-0.287***	-0.542***	-0.411***	-0.160**

*Significance at 10% level; **Significance at 5% level
***Significance at 1% level

In Table 4, the first six models come to answer the first hypothesis. The testing starts with a baseline regression, Model 1, where it can be observed that the relationship between **Total Crime** and **Economic growth** is negative and is statistically significant at 5% significance level. Since the natural logarithm of the Total Crime variable has been taken, the data will be interpreted a bit different than with the basic variable. When interpreting a regression where there is y & log x, where y is the dependent variable and x is the independent one, then an increase in 1% in x would lead to $\beta/100$ increase/decrease in y, therefore it can be said that an increase of 1% in *LnTotalCrime* leads to a decrease of 0.00286 % in *Economic Growth***.** The R squared is 0.018 and the P-value of the model being 0.045, which is statistically significant at 5% significance level. In model 2, the first determinant of economic growth, which is human capital accumulation defined as population growth, is added to the regression. This variable has a statistically significant negative effect at 1% significance level and a β of -1.41. Since economic growth is defined as GDP per capita growth, is seems reasonable to have a negative effect of population growth. The bigger the number to which the GDP has to be spread, the lower the

outcome will be. When tested for correlation, the relationship between them is statistically negatively significant with a value of -0.316, thus confirming the hypothesis of a negative linear relationship between the variables. A negative correlation between these variables is in accordance with the study of Temple (Temple, 1999). The interpretation of results is as follows, an increase in 1 unit of *Population Growth* leads to a decrease of -1.41 units in *Economic Growth*. Moreover, the β of *LnTotalCrime* stays the same, meaning that there is no relationship between total crime and population growth, or at least one does not affect the other. This result is quite unexpected since one of the main assumptions was that crime directly affects the population growth. But this event might be explained by the fact that, European Union countries are studied, thus this is a developed part of the world. The amount of crimes committed are relatively not that many as compared to other parts of the world, for instance third-world countries, where they might have a significant impact on population growth, and as a result on economic growth. The R squared jumps now to 0.114, the adjusted R square to 0.105 and the P-value to 0.000, being statistically significant at 1% level. Important to mention that, from now on, all the models tested have a P-value of 0.000. In model 3, when adding the *Savings* variable, which represents the capital stock and which is statistically significant at 1% level, *LnTotalCrime* becomes statistically insignificant. The β of *Savings* variable is 0.352, meaning that a 1 unit increase in capital stock will increase the *Economic Growth* with 0.352 units. The accumulation of capital stock seems to have twofold beneficial effects, first it enhances the economic growth per se and second it improves the economic conditions by diminishing the effect of total crime. This observation seems reasonable due to a number of reasons. According to Keynes, total spending is the critical determinant of the overall level of economic activity (Pearson Education), moreover, investing in capital a government diminishes unemployment (Karanassou et al., 2007), thus this result shows that by increasing the government consumption, it might discourage people to engage in criminal activities due to different reasons, but the most plausible one being financial stability. A similar outcome was observed in the study of Goulas and Zervoyianni (2012) where they found evidence that the increasing levels of crime do not have an independent effect on economic growth under favorable economic conditions. The R squared and adjusted R squared have now increased to 0.259 and 0.248 respectively, which is a significant increase from the previous models. In model 4, *Education* is added to the regression. It is statistically significant at 10% significance level and has a β of -0.031, meaning that a 1 unit increase in

Education will decrease the *Economic Growth* with 0.031 units. This phenomenon is of great interest, because it was expected that this variable would have a positive effect on economic growth. Moreover it does not have any significant effect on *LnTotalCrime,* it remaining statistically insignificant**.** The R squared has increased to 0.272 and the adjusted one to a value of 0.257. In model 5, *LnTechnologicalChange* has been added. This variable is not statistically significant and has no effect on the significance of *LnTotalCrime,* but it affects *Education* making it insignificant and diminished the significance of *Savings* from 1% to 5%, β being diminished to 0.315. The effect on education and savings might be explained by the fact that technological change has the effect of "creative destruction", thus causing old technology, skills, ideas, and equipment to become obsolete (Library of Economics and Liberty, 2008). The R squared and adjusted R squared have now the values of 0.273 and 0.251. In order to answer the first hypothesis, another regression was performed, which is model 6, and which does not include the *LnTotalCrime* variable. In this regression the only statistically significant variables are *Population Growth* and *Savings*. The findings suggest that in the presence of crime, even if *LnTotalCrime* is statistically insignificant, some determinants are being altered. *Population Growth* has now a β of -1.461, meaning that *Economic Growth* will be less affected by increasing population, while the β of Savings is being lowered to 0.315, meaning that the level of savings contributes less to the economic growth. R squared and the adjusted R squared are 0.284 and 0.268 respectively. It results that the null hypothesis is not rejected, thus *Total crime does **NOT** have a statistically significant negative impact on economic growth when included in the augmented Solow growth model adjusted to technological progress.*

In order to test the second hypothesis, the next four regressions will be performed. In model 7, *LnFDIinflow* has been added to the regression. It turns out that this variable is statistically significant at 1% level and its β has a value of 2.487. Since this variable is a logarithmized one, the interpretation of it is done similar to the independent variable of *LnTotalCrime,* an increase of 1% in *LnFDIinflow* leads to an increase of 0.02487 % in *Economic Growth*. Going back to Table 3, it can be noticed that *LnTotalCrime* correlates with *Openness to Trade,* thus a new variable has been created, specifically *Openness to Trade Orthogonalized*. When added to the regression in model 8, *Openness to Trade Orthogonalized* has no statistically significant effect on *Economic Growth*. By adding *Political Stability* to the regression, the full model, the 9-th one, is finally achieved. *Political stability* turns out to be statistically significant

at 1% level having a β of 1.899. It can be said that a 1 unit increase in *Political Stability* increases the *Economic Growth* with 1.899 units. During the testing of models 7 to 9, *LnTotalCrime* was never a statistically significant variable. Also during the tests, the values of R squared and adjusted R squared have altered from 0.341 and 0.316 in model 7 to 0.369 and 0.312 in model 9 respectively. In order to be able to answer the second hypothesis, model 10 has been tested. This model did not include the variable of *LnTotalCrime.* In this regression, *Population Growth* and *LnFDIinflow* were statistically significant at 1% level, whereas *Savings* and *Political Stability* were statistically significant at 5% level and the βetas of them were diminished to 0.268, in case of *Savings* and increased to 1.899, in case of *Political Stability*. This suggests that even if crime does not a statistically significant effect on economic growth, it still affects the determinants and stresses the importance of savings, even though they contribute less now being lowered from 0.272 to 0.268 units, it stresses the importance of political stability enhancing its contribution from 1.822 to 1.899 units and of FDI inflows, from 0.024 to 0.026 units. In addition, R square and adjusted R square had the values of 0.358 and 0.331 respectively. From models 9 and 10 it directly follows that the null hypothesis is not rejected, thus *Total crime does **NOT** have a statistically significant negative impact on economic growth.*

In order to test the third hypothesis, different types of crime will be used. In models 11 to 14, *LnHomicide, LnViolentCrime, LnRobbery and LnDomesticBurglary* have been tested. Moreover, *Openness to Trade Orthogonalized* has been added as a control variable and *Political Stability Orthogonalized* variable has been added to the regression models which were testing the effect of *LnHomicide* and *LnDomesticBurglary*. The results of these models show that different types of crime do not have statistically negative impact on economic growth, but the presence of each type of crime still has an effect on the determinants. *LnHomicide* has the biggest effect on *Population Growth* and *Political Stability* increasing the values of β to -1.318 and 2.395 respectively. Important to mention is that all the βetas are expressed in units. These are values with which they contribute to an economic growth, when the control variables are being increased by 1 unit. *Savings*, when homicides are present, has a contribution of 0.293 units, while FDI inflow contributes with 0.0237 percent[5], which is lower than when the presence of homicides is absent. *LnViolentCrime* affects the most *Population Growth* and *Political Stability*

[5] *LnFDIinflow* has β with the value of 2.373, thus an increase of 1% in *LnFDIinflow* leads to an increase of 0.0237 % in *Economic Growth*.

as well, altering the values of β to -1.543 and 1.863 respectively. *Savings*, when violent crime is present, has a contribution of 0.286 units, while FDI inflow contributes with 0.0242 percent. *LnRobbery* affects the most *Political Stability* and *FDI inflow* altering the values of β to 1.904 and 0.0242 respectively. *Savings*, when robbery is present, has a contribution of 0.280 units when increased with 1 unit, while *Population Growth* contributes with -1.514 units when being increased with 1 unit. *LnDomesticBurglary* affects the most *Political Stability* and *Savings* altering the values of β to 2.079 and 0.290 respectively. *Population Growth*, when domestic burglary is present, has a contribution of -1.503 units when increased with 1 unit, while *FDI inflow* contributes with 0.0243 percent when being increased with 1 percent.

Table 4. Dependent variable: Economic Growth	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	*5.336***	***5.705****	***-3.989****	-1.949	-2.590	-3.391
LnTotalCrime	*-0.286***	*-0.286***	-0.137	-0.072	-0.056	
LnHomicide						
LnViolentCrime						
LnRobbery						
LnDomesticBurglary						
Population Growth		***-1.410****	***-1.354****	***-1.335****	***-1.461****	***-1.517****
Savings			***0.352****	***0.316****	*0.315***	***0.316****
Education				-0.031*	-0.027	-0.025
LnTechnologicalChange					0.080	0.055
LnFDIinflow						
Openness to Trade						
Openness to Trade ORT LnTotalCrime						
Openness to Trade ORT LnHomicide						
Openness to Trade ORT LnViolentCrime						
Openness to Trade ORT Robbery						
Openness to Trade ORT LnDomesticBurglary						
Political Stability						
Political Stability ORT LnHomicide						
Political Stability ORT LnDomesticBurglary						
N	***225***	***224***	***214***	***190***	***175***	***184***
R squared	***0.018***	***0.114***	***0.259***	***0.272***	***0.273***	***0.284***
Adjusted R squared	***0.014***	***0.105***	***0.248***	***0.257***	***0.251***	***0.268***
P value of the model	***.045***	***.000***	***.000***	***.000***	***.000***	***.000***

*Significance at 10% level; **Sign. at 5% level; ***Sign. at 1% level

Model 6&10 do not include any type of crime

	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
Constant	*-8.496***	*-8.483***	-10.978	***-6.377****	*-7.915***	***-9.870****	***-9.527****	***-7.132****
LnTotalCrime	0.064	0.064	0.244					
LnHomicide					0.271			
LnViolentCrime						0.203		
LnRobbery							0.191	
LnDomesticBurglary								0.075
Savings	***-1.353****	***-1.351****	***-1.498****	***-1.501****	***-1.318****	***-1.543****	***-1.514****	***-1.503****
Population Growth	***0.240****	***0.240****	***0.268****	*0.272***	***0.293****	*0.286***	*0.280***	*0.290***
Education	0.008	0.008	-0.013	-0.015	-0.013	-0.015	-0.015	-0.015
LnTechnologicalChange	-0.119	-0.123	-0.440	-0.326	-0.468	-0.396	-0.341	-0.448
LnFDIinflow	***2.487****	***2.486****	***2.646****	***2.409****	***2.373****	***2.426****	***2.425****	***2.426****
Openness to Trade				-0.012				
Openness to Trade ORT LnTotalCrime		0.000	-0.008					
Openness to Trade ORT LnHomicide					-0.004			
Openness to Trade ORT LnViolentCrime						-0.010		
Openness to Trade ORT Robbery							-0.010	
Openness to Trade ORT LnDomesticBurglary								-0.010
Political Stability			***1.899****	*1.822***		*1.863***	*1.904***	
Political Stability ORT LnHomicide					***2.395****			
Political Stability ORT LnDomesticBurglary								*2.079***
N	***167***	***167***	***167***	***174***	***174***	***174***	***174***	***173***
R squared	***0.341***	***0.341***	***0.369***	***0.358***	***0.372***	***0.359***	***0.358***	***0.352***
Adjusted R squared	***0.316***	***0.312***	***0.337***	***0.331***	***0.342***	***0.328***	***0.327***	***0.320***
P value of the model	***.000***	***.000***	***.000***	***.000***	***.000***	***.000***	***.000***	***.000***

6. Conclusion

This thesis has established that there is no statistically significant effect of crime on economic growth in the European Union countries between 2004 and 2012. The results of the regression analysis fail to support the hypothesis that total crime has a statistically significant negative impact on economic growth when included in the augmented Solow growth model adjusted to technological progress. The observations suggest that, statistically, the accumulation of capital stock offsets the effect of crime. By increasing the government consumption, this might discourage people to engage in criminal activities due to different reasons, but the most plausible one being financial stability. Nevertheless, even if crime is not statistically significant it still alters some determinants, population growth contributing more to an economic growth, while savings contributing less.

The results also fail to support the second hypothesis that crime has a statistically significant negative impact on economic growth. The results suggest that even if crime does not have a statistically significant effect on economic growth, it stresses the importance of savings, even though they contribute less to an economic growth, and it affects the population growth which contributes more now. These findings are similar to the results of testing the first hypothesis. In addition, crime stresses the importance of political stability and FDI inflows enhancing their contribution to an economic growth. Since the countries from European Union have been investigated, it seems reasonable to obtain such results. The amount of crimes committed is not high enough to exert a statistically significant effect on economic growth, but they still have an effect on economic growth.

The aim of this thesis was to explain the magnitude of the effect of crime on economic growth, depending on the type of crime. The findings from the regression analysis suggest that different types of crime do not have any statistically significant effect on economic growth, but similar to the results from testing the first two hypotheses, the presence of different types of crime has an effect on the determinants. The biggest effects on economic growth, as expected, have the homicides, followed by domestic burglary, robbery and violent crime.

7. Limitations

Limitations of this study present some space for further improvement in investigating the effect of crime on economic growth. First limitation is the small range of years used to investigate this subject, therefore enlarging the dataset is desirable. The majority of the European Union countries are ranked as developed, hence maybe the analyzed dataset for the number of recorded crimes was not sufficient to achieve statistically significant results. Second limitation might be the proxies used, since it is not yet clear which of the determinants have to be used in order to investigate the impact of crime on economic growth. Moreover, using crime rates instead of absolute values of crime might give additional insight the impact of crime on economic growth. By dividing the number of crimes to the population sizes of the countries, crime variables may function as a proxy for country sizes as well, thus taking into account for additional correlation that might be between population size and growth. Forth limitation might be the region analyzed. By analyzing separately Western and Eastern European Union countries, this might add a lot of value to this research and result in a clearer effect of crime. The fifth limitation might be the types of crime analyzed. By investigating a broader set of types of crime, a more accurate analysis of the magnitude of the impact of crime on economic growth might be done.

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Appendix

Table 1. Summary statistics of the variables

Variable	Number of observations	Minimum	Maximum	Mean	Standard deviation
Economic Growth	234	-8.97	9.87	1.59	3.7243
Savings	242	-2.26	2.88	0.27	0.8440
Education	230	10.61	34.39	21.92	4.5706
Population Growth	219	25.05	95.09	64.22	14.4630
Techological Change	227	3.04	30.89	12.45	6.8150
FDI inflow	219	-1.32	15.26	4.01	3.5534
Openness to Trade	226	48.02	191.37	107.10	39.4644
Political Stability	243	-0.47	1.59	0.76	0.4163
Total Crime	234	7104	6633156	1059349.43	1592392.6580
Homicide	243	0	1048	237.79	252.4710
Violent Crime	241	301	1058005	88414.66	182115.7630
Robbery	243	62	127190	20285.20	32005.3090
Domestic Burglary	241	667	352422	50298.40	70719.0890

Table 2. List of 27 countries of European Union (EU-27)

Austria	Finland	Latvia	Romania
Belgium	France	Lithuania	Slovakia
Bulgaria	Germany	Luxembourg	Slovenia
Cyprus	Greece	Malta	Spain
Czech Republic	Hungary	Netherlands	Sweden
Denmark	Ireland	Poland	UK
Estonia	Italy	Portugal	