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Income Inequality and Property Crime in Selected Southern and Eastern European Countries

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ABSTRACT

This paper examines the impact of income inequality on the property crime by testing its effect using pooled mean group (PMG) estimator developed by Pesaran et al. (1999). Income inequality is specifically seen as the most noticeable feature of a bigger and more complex issue; less than 10 percent of the wealth in developed and developing countries is controlled by the poorest. Data from 14 emerging countries in the Southern and Eastern European regions were used to test and extend the income inequality and crime hypothesis. Variables such as the rule of law, unemployment, and education were also employed to examine their effects on property crime rate. The findings confirmed that the income inequality is positively associated with property crime rate. The rule of law, unemployment, and level of education also revealed a meaningful relationship with property crime rate in these regions.

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INTRODUCTION

High crime rate in a country will have a negative effect on the quality of life of the residents of that country. This study focuses on property crime, with an emphasis on burglary and theft crime. The notable reasons for committing this type of crime are unemployment and poverty. High levels of unemployment and poverty can be found in the area in which the rate of income inequality is high. During the past few decades, globalization, while reducing cross-country income inequality, has increased within-country inequality since near-term rapid economic growth generates greater income inequality. Trade liberalization, therefore, has shifted the economic inequality from a global to a domestic scale, increasing the risk of a more momentous impact of inequality on crime (Bhalla, 2002). It is, therefore, pertinent to mention here that the issue of inequality and the aspects related to it are anything but new with regard to the discourse about the causes of crime. The issue has been dealt with from various points of view since the nineteenth century. However, two main approaches to this issue have dominated the social sciences scenario over the past decades. The first approach is socio-cultural that follows Merton's seminal study on anomie and relative deprivation (1949). The second approach is the so-called economic rational choice theory of crime addressed in Becker's (1968) and Ehrlich's (1974) works. These approaches are explained in the literature section of this paper.

Societies or communities with high level of income inequality tend to have more fear of crime than societies with less inequality of income (Vauclair & Bratanova, 2016). The Gini index, which is also known as the Gini coefficient, is the most prominent measure of income inequality. As of 2013, Bulgaria, Romania, Turkey, and Greece had the highest income disparity in Europe, the richest 10 percent in Bulgaria earned about 13.69 times more than the poorest 10 percent, in Romania it was 14.55 while in Greece it was 15.36 (Eurostat, 2013). The Gini coefficients in Turkey as of 2013 was 0.43, which was rather high, Bulgaria had 0.35, Greece had 0.344, and Portugal recorded 0.342. The average Gini index for the 14 sampled countries of this study as of 2014 was 0.34 (Eurostat, 2016). The income inequality can have both direct and indirect effects on the economic growth; the indirect effect of inequality on Gross Domestic Product (GDP) per capita comes as a result of the positive impact it has on the crime rate. During this period under study, in this particular regions, the property crime became common, especially burglary and theft crimes, which covers about 83 percent of the total crime (Eurostat, 2016). In the EU-28, the domestic burglary has increased by 14 percent between 2007 and 2012 (Eurostat, 2014). Greece has recorded the highest increase in the number of domestic burglary by 76 percent, Spain recorded an increase of 74 percent in domestic burglary, Italy had 42 percent, Romania with 41 percent, and Croatia 40 percent. On the contrary, huge reductions in this category of crime were recorded only by Lithuania and Slovakia with -36 percent and -29 percent, respectively (Eurostat, 2014). The European Commission defines domestic burglary as gaining access to another person's dwelling by force in order to steal properties. The United Nation Office on Drugs and Crime (UNODC) reported in 2011 that the property crime rate is expected to increase across European countries in the coming years.

As stated earlier, the income inequality leads to high crime rate, the crime, in turn, affects the growth of an economy (Kumar, 2013; Detotto & Otranto, 2010). Over the period of 2008-2013, most European countries have recorded an increase in the rate of property crime. For instance, according to Eurostat (2015), Romania has recorded an increase in the rate of total property crime (rate per 100,000 inhabitants), from 46.3 in 2008 to 129 in 2014. Sweden, despite a Nordic and a developed country, recorded the rate of 193.23 per 100,000 populations in 2008 as the number of victims of property crime; the rate kept increasing through 2014 with the number of victims around 434. Bulgaria recorded 504.56 victims per 100,000 populations in 2008, while in 2014 a number of 622 victims was recorded. Countries like Italy, Slovenia, Spain, among others, have also recorded a rise in the rate of property crime. What is then the reason behind the rising number of property crime victims in Europe?

In 1992, the general strain theory developed by Robert Agnew was written at the social psychological levels, which focuses on the individual and his immediate environment incorporating the argument of the strain theory by Merton (1938). The theory categorizes strains under three main categories: strain as the failure to achieve positively valued goals, strain as the removal of positively valued stimuli from the individual and, lastly, strain in response to the presentation of negative stimuli (Agnew, 1992). The theory, thus, suggests that there is a possible correlation between the income inequality and crime rate as a way of seeking revenge against the negative stimuli such as inequality among households and individuals. The general strain theory has been considered to be a solid theory and has attracted a significant amount of empirical evidence.

Both developed and emerging European countries face the problem of income disparity among their citizens. The Organisation of Economic Co-operation and Development (OECD) decries the increasing income inequality stating that the top income earners in the developed countries earn almost 10 times more than those at the bottom of the income scale, not to mention even greater disparities in the emerging countries (OECD, 2015). This explains why most of the European developed countries have been experiencing this problem. Fredriksen (2012) argued that the main reasons behind the increase in income dispersion in Europe in recent years are the EU enlargement and the large income gains among the top 10 percent within the core of eight European countries. These two reasons are attributed to a number of factors such as skill-biased technological change, deregulation of financial sector, globalization of financial operation, and offshoring of businesses among others (European Union, 2014).

The purpose of this study is to examine the impact of income inequality on property crime in 14 Southern and Eastern European countries. These countries are Bulgaria, Croatia, Cyprus, Czech Republic, Greece, Hungary, Italy, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Turkey. The remainder of this paper is drafted as follows: section 2 reviews the related literature, section 3 addresses the method used, the results of our findings are presented in section 4 and finally, section 5 presents our conclusions.

REVIEW OF LITERATURE

The socio-cultural approach that follows Merton's seminal study on anomie and relative deprivation (1949) argues that, in some societies, lower classes are particularly driven to crime because — though influenced by the universal goal of economic success — they have scarce access to the legitimate means leading to such success. Within this approach, inequality, unemployment, etc., are taken into consideration because they are part and parcel of the above-mentioned scarce access to legitimate means. However, this approach posits that inequality, poverty, and unemployment trigger crime propensity only in so far as they are associated with a culture that regards economic success as a universal goal, regardless the original status of the individual. In other words, the premises of this approach are social and cultural, rather than just economic. This approach has been blamed for being often unable to translate its rich socio-cultural considerations of qualitative character into falsifiable results by means of a quantitative analysis. However, there are also appreciable quantitative analyses of the inequality-crime link using the anomie approach. The standard reference work is by Blau and Blau (1982) who found that, in the 125 largest metropolitan areas of the US, both poverty and economic inequality increase rates of criminal violence; but once the economic inequalities are controlled, the poverty no longer influences these rates. Later works include Savolainen (2000) that analyzed income inequality and crime in two sets of countries; Bjerregaard and Cochran (2008) that analyzed income inequality and homicide rates in 49 countries, and Dahlberg and Gustavsson (2008) that distinguished between permanent and temporary inequality as crime determinants.

The so-called economic rational choice theory of crime, which following Becker's (1968) and Ehrlich's (1974) pioneering studies, assumes that crime is a rational option whenever its benefit outweighs its cost. Crime costs and benefits, in turn, are influenced by economic conditions that affect both legitimate opportunities (supply) and returns to crime (demand). Becker and Ehrlich tried to show that the crime propensity is the result of a choice based on calculations regarding, on the one hand, unfavorable economic conditions (measured by unemployment, low average income, share of people with income below one-half of the median income, Gini index etc.) that translate into crime benefits for the offenders and, on the other hand, costs met by the offenders (e.g. punishment, measured as the average time spent by offenders in prison). This approach is against any cultural and social interpretation because it suggests that the homo economicus is the same in any society and culture and is moved everywhere only by economic considerations of costs and benefits. On this basis, the economic approach tends to underestimate the social and cultural differences behind costs and benefits while it privileges the use of rather sophisticated econometric analyses in order to predict the crime propensity by means of the said costs and benefits for the offenders.

Few others have found positive effects; Imrohoroglu et al. (2000) have utilized the data of crimes in the United States using the general equilibrium model and Ordinary Least Squares (OLS) method to examine the relationship between income distribution and crimes in the United States. The fact is that most crimes (property and violent crimes) are committed by the less privileged citizens of the society. These citizens or members of the society face greater pressures and enticements to commit crime in the areas of high inequality. Fajnzylber et al. (2002) have concluded that the income inequality has a significant and positive effect on the incidence of crime.

Sharma (2011) pointed out that the inequality increases most types of property and violent crimes in India. Carvalho and Carvalho and Lavor (2008) revealed that the increasing inequality in Brazil leads to more victimization. It has long been recognized by criminologists that victimization is an important perspective to understand crime. Bourguignon et al. (2003), using a simple theoretical model and panel data in seven cities of Columbia, suggested that a group of population which most matters for time fluctuations in the crime rate are those people whose income per capita lies below 80 percent of the mean of the population. Stucky et al. (2016) have found that lower levels of neighborhood income is associated with higher violent and property crime in the state of Indiana, United States. Enamorado et al. (2016) have also found that during Mexico's drug war, the income inequality increases drug-related homicides in the country. Coccia (2017) revealed that the socioeconomic inequality induces high rates of intentional homicides in society. Buttrick and Oishi (2017) argued that living in highly unequal regimes is associated with both increased mistrust and increased anxiety about social status. A study by Ishak and Bani (2017) also revealed that GDP per capita, unemployment, and population density determine the property crime in four developed states in Malaysia.

Moreover, these few studies were not on a panel of European countries except that of Vauclair and Bratanova (2016) that studied the relationship between income inequality and the fear of crime. They found that people living in a society with more inequality of income are fearful of crime. They used data from the European Social Survey (ESS) and adopted a more general view on the fear of crime by examining its antecedents at multiple levels of analysis as well as its psychological consequence. The study can be distinguished regarding its explanation on the factors considered as having association with the fear of crime. Thus, the aim of this study is to examine the impact of income inequality on property crime in a panel of 14 selected Southern and Eastern European countries.

The major literature gaps found by this study are the inability of the previous studies to include the rule of law and the interaction of the rule of law and income inequality in estimating the relationships. Moreover, previous studies on the relationship between income inequality and crime in Europe were mainly time-series studies on Germany (Entorf and Spengler, 2002) and Sweden (Nilsson, 2004), the other is on a panel of municipals in Finland (Huhta, 2012) which used GMM analysis. On the other hand, a panel survey study was conducted by Vauclair and Bratanova (2016) on Europe in which the study used "fear of crime" (as dependent variable) instead of crime or property crime. The functions of the current study is to incorporate the rule of law, interacts it with income inequality in an interactive equation, focus on the Southern and Eastern European countries and apply the pooled mean group (PMG) technique. The study will, therefore, be different from other previous studies in terms of the variables used, the estimation technique as well as the area or scope of the study.

RESEARCH METHODOLOGY

In achieving the objectives of this study, the Pooled Mean Group (PMG) estimator developed by Pesaran et al. (1999) was used on pooled cross-country time series data to examine the effect of income inequality on property crime in 14 selected Southern and Eastern European countries. We intended to focus on these countries because most of the countries are emerging ones and are characterized by fast economic growth. In addition, fast economic growth is expected to be associated immediately with increasing inequality and only later with decreasing inequality. In other words, emerging countries are of particular interest to the issue of inequality because they are expected to confirm the inverted U curve, which should characterize the relationship between economic growth and income inequality: an aspect discovered by Simon Kuznets and presented in a well-known paper published more than 60 years ago (Kuznets, S. 1955. "Economic Growth and Income Inequality", American Economic Review 45(1):1-28). Although all of the selected countries could hardly be described as "emerging countries", we found that these countries (excluding Italy and Spain) are characterized by intermediate income, brisk economic growth, institutional transformations, and economic opening.

Other variables like the rule of law, unemployment, educational level, and immigrant status were included in the study. The income inequality data and the data for the control variables, except for immigrants, were taken from the World Bank's World Development Indicator (WDI) while the data on property crime and immigrants were taken from the Eurostat database. All data are annual and covered the period from 1993 to 2014. A panel unit root test of stationary is conducted first, followed by the panel cointegration and then the main PMG estimator, which assumed homogeneous long run parameters but assumed dynamic in the short run parameters

and later the error variance is calculated. The authors used the rule of law – in lieu of some measures of punishment, which is a common option in crime analysis following the economic rational choice theory of crime – as crime cost. The rule of law is expected here to counterbalance the pressure to committing crime exerted by inequality. The data for the rule of law was collected from the World Bank's WGI. Therefore, "the rule of law" is an estimation of the consistency of the action of the justice system in the various countries. The variable, unemployment has been used to proxy economic conditions in the whole population, both unemployed and employed (Cantor and Land, 2001; Phillips and Land, 2012). Research works have suggested, moreover, that unemployment could be a better indicator of social malaise than the low income and inequality itself due to the fact that it implies also the loss of a meaningful role in a society (Hooghe et al., 2010).

Panel Unit root test

This study conducted three types of panel unit root tests; Levin et al. (2002), Im et al. (2003) and ADF Fisher test by Maddala and Wu (1999) in which all three assume a null hypothesis of non-stationary. Moreover, the tests are Augmented Dickey-Fuller (ADF) test generalization from a single time series to panel data (Baltagi et al., 2005). Recent research works suggest that panel unit root tests have higher power than unit root tests based on individual time series. They are generally called the panel unit tests but theoretically, they are basically known as the multiple series unit root tests applied to panel data structures in which the presence of cross sections generates multiple series out of a single series, (Baltagi et al., 2005). Tests of panel unit root may be similar, however, not necessarily identical with the tests of single series unit root. On the basis of whether there are restrictions on the autoregressive (AR) process across cross-sections, we will have the following AR(1) process of panel data:

$$y_{it} = \rho_i y_{it-1} + X_{it}\delta_i + \epsilon_{it} \quad (1)$$

where i = 1, 2, …., N cross-section unit observed over period, t = 1, 2, …., T.

The X_{it} represents the exogenous variables in the model including any fixed effects or individual trends, ρ_i are the autoregressive coefficients, and the errors ϵ_{it} are assumed to be mutually independent idiosyncratic disturbances. If $|\rho_i| < 1$, y_i is said to be softly stationary. If on the other hand, $|\rho_i| = 1$, then y_i contains a unit root. Moreover, two natural assumptions for testing purposes can be made about the ρ_i; the assumption that the persistence parameters are common across cross-section so that $\rho_i = \rho$ for all i, Levin, Lin and Chu (2002) test employs this assumption. If on the other hand, ρ_i can vary freely across cross-section, then the assumption conforms to that of Im, Pesaran and Shin (2003) and ADF Fisher proposed by Maddala-Wu (1999).

Panel cointegration test

The panel cointegration technique has also been applied to test the presence of long run relationship among integrated variables. The precondition for testing panel cointegration is that all variables under study must be integrated of order one, I(1), (Pedroni, 1999). This means that the variables should be non-stationary at level, I(0). According to Pedroni (1999), the panel cointegration statistics support the version of weak PPP hypothesis. In a general form, the following regression model will be considered.

$$y_{it} = \alpha_i + \delta_i t + \gamma_t + X_{it}\beta_i + \varepsilon_{it} \quad (2)$$

where i = 1, 2, …., N and t = 1, 2, …., T.

X_{it} is a vector for each member i, here, we refer to scalar case, x_{it}, to simplify the notation and show any condition in which generalizations are not immediate to the vector case (Pedroni, 1999). So, the variables y_{it} and x_{it} (dependent and independent variables) are assumed to be integrated of order one, I(1), for each member i of the panel and under null of no cointegration, the residual ε_{it} will also be I(1). Hence, the (1) is referred to as a spurious regression. The parameters α_i and δ_i allow the possibility of member specific fixed effects and deterministic trends respectively, while the parameter γ_t permits the possibility of common effects that are shared across individual members of the panel in any given period. In general, the slope coefficient β_i will be permitted

to vary by individual, though, in a case where it takes on a common value, $\beta_i = \beta$ for all members will also be considered.

Pooled mean group (PMG) estimator

The pooled mean group entails the pooling and averaging of parameters. It is, therefore, an intermediate estimator. The PMG restricts long run parameters but allows error variance, short-run coefficients, and intercepts to vary. This is because pooled mean group allows dynamic specification; it assumes weak homogeneity of parameters across countries, the PMG permits dynamic specification (including the lags order) to be different across countries. The PMG estimator examines the long run correlation among variables across countries by not striking homogeneity of short run parameters based on autoregressive distributed lag system (Pesaran et al., 1999).

The estimation method of PMG occupies position in between the MG and the dynamic fixed effects (DFE); the DFE restricts slope coefficients but allows intercepts to differ across countries. The PMG has the lead to estimate long and short run dynamic relationships in a cross-sectional dynamic heterogeneous panel data. For example, given the unrestricted ARDL $(p,q_1, \ldots . q_k)$ specification for dynamic panel model:

$$y_{it} = \sum_{j=1}^{p} \lambda_{ij}\, y_{i,t-j} + \sum_{j-1}^{q} \dot{\gamma}_{ij}\, x_{i,t-j} + \mu_i + \varepsilon_{it} \tag{3}$$

where t = 1, 2, …., T, is the time period; i = 1, 2, …., N, is the number of countries, x_{it} is the (k x 1) vector of explanatory variables for a country i; γ_{ij} are the (k x 1) coefficient vectors; λ_{ij} are scalars and μ_i represents country fixed effects. The model above can be re-parameterized as a VECM system.

$$\Delta y_{it} = \varphi_i\left(y_{i,t-1} - \dot{\beta}_i x_{it}\right) + \sum_{j=1}^{p-1} \gamma_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \dot{\gamma}_{ij} \Delta x_{i,t-j} + \mu_i + \varepsilon_{it} \tag{4}$$

where $\varphi_i = -(1 - \sum_{j=1}^{p} \lambda_{it}), \beta_i = \sum_{j=0}^{q} \gamma_{ij,}\, \lambda_{ij} = -\sum_{m=j+1}^{p} \lambda_{im}, j = 1,2, \ldots, p-1, and\ \gamma_{ij} = -\sum_{m=j+1}^{p} \gamma_{im},\ j = 1,2, \ldots, q-1$

The long run parameter for a country given by β_i and φ_i is the equilibrium or error correction parameter. When $\varphi_i = 0$, it indicates the non-presence of relationship among variables in the long run. The expected sign of parameter is to be negative and significant to insinuate the speed of adjustment or convergence to long run equilibrium. The PMG estimator restricts the element of β to be identical across countries under the following assumptions:

ε_{it} are independently distributed across i and t, with mean 0, variances $\sigma_i^2 > 0$, and finite fourth-order moments. They are also distributed independently of the regressors x_{it}. The assumption of independence between the disturbances and the regressors is required for consistent estimation of the short run parameters.

The ARDL $(p, q, \ldots . q)$ model (4) is stable; the roots of $\sum_{j=1}^{p} \lambda_{ij} z^j = 1$ lie outside the unit cycle. The assumption requires that $\theta_i < 0$, which implies the existence of a long run relationship between y_{it} and x_{it} described by $y_{it} = -\left(\frac{\dot{\beta}_i}{\varphi_i}\right) x_{it} + \eta_{it}$ where η_{it} is a stationary process. This assumption also ensures that the order of integration of y_{it} is at most equal to that of x_{it}.

For the long run homogeneity, the long run parameters defined $\theta_i = -\beta_i/\varphi_i$, are the same across the countries, namely θ_i and θ, i = 1, 2, ….N. Both the country-specific short run parameters and the common long run coefficients are computed by a maximum likelihood estimation. The parameters of interest are the long run effect and adjustment coefficients. The PMG estimator produces consistent estimates of parameters that are asymptotically normal for both stationary and non-stationary I(1) regressors (Pesaran et al., 1999).

The model

Based on the inequality and crime theory and as recommended by Neumayer (2005), the basic model for this study is as follows:

$$Cr_{it} = \beta_0 + \alpha_1 Inq_{it} + \alpha_2 RGDPC_{it} + \alpha_3 Imgr_{it} + \alpha_4 Ue_{it} + \alpha_5 Edu_{it} + \mu_{it} \quad (5)$$

where *Cr* is property crime rate, *Inq* is income inequality, *RGDPC* is real GDP per capita, *Ue* is unemployment rate, *Imgr* is percentage of immigrants to total population, *Edu* is education level, and μ_i is the error term. The variable level of education is included following a study by Huhta (2012) who integrated the variable into his model.

The same way as North (1991) conceptualizes good institutional quality as a device that organizes socioeconomic and political interaction, this study, therefore, includes the rule of law as a measure for institutional quality to examine the relationship between rule of law and property crime rate. We feature the rule of law in equation (6) below:

$$Cr_{it} = \beta_0 + \alpha_1 Inq_{it} + \alpha_2 ROL_{it} + \alpha_3 RGDPC_{it} + \alpha_4 Imgr_{it} + \alpha_5 Ue_{it} + \alpha_6 Edu_{it} + \mu_{it} \quad (6)$$

In the equation (6) above, the sign of α_1 is expected to be positive to indicate that the high property crime is associated with the rising income inequality, while the coefficient of α_2 is expected to be negative indicating that a better quality of rule of law reduces the property crime rate (Neumayer, 2005, Neumayer, 2003). The α_3 is also expected to be negative, which means that when the real GDP per capita increases, this will lower the crime rate (Neumayer, 2003). The signs of α_4 and α_5 are expected to have a positive relationship with the crime rate; this is because the high percentage of immigrants and unemployment rate are said to have an association with the high crime rate (Huhta, 2012). The last coefficient α_6 is expected to have a negative sign to show that higher level of education among individuals lowers the level of crime rate (Brilli & Tonello, 2014).

If we consider relating the inequality of income and the quality of institutions, we accept the remark given by Chong and Gradstein (2004) that a significant relationship between income inequality and institutional weakness exists. In order to include this into our model, we create an interactive equation so as to examine the interaction of rule of law with the income inequality on crime. To do so, we transform equation (6) to have an interactive equation (7) as in the work of Brambor et al. (2006). This is to explain deeper on the effect of income inequality on the property crime rate.

$$Cr_{it} = \beta_0 + \alpha_1 Inq_{it} + \alpha_2 ROL_{it} + \alpha_3 (Inq \times ROL)_{it} + \alpha_4 RGDPC_{it} + \alpha_5 Imgr_{it} + \alpha_6 Ue_{it} + \alpha_7 Edu_{it} + \mu_{it} \quad (7)$$

$$i = 1, 2, \ldots, N \qquad t = 1, 2, \ldots, T$$

In equation (7) above, α_1 and α_2 will be interpreted, this is because according to Brambor et al. (2006), it is proper to have a positive/negative and significant coefficient of α_1 and α_2, hence, the rule of law as the mediator is expected to reduce the effect of income inequality on the crime rate. Therefore, α_3 is expected to be marginally positive. The real GDP per capita growth (α_4) is expected to be negatively associated with lower crime rate. The signs of α_5 and α_6 are expected to be positive to show that high percentage of immigrants and unemployment rates induce the crime rate (Huhta, 2012). The sign of α_7 is to be negative to show that higher level of education reduces the crime rate (Brilli & Tonello 2015).

As mentioned earlier, the current study uses PMG estimator to analyze the impact of our independent variables on the property crime rates. The PMG estimator examines the long run correlation among variables across countries by not striking homogeneity of short run parameters based on autoregressive distributed lag system (Pesaran et al., 1999). Based on the advantages of PMG mentioned above, this study adopts the PMG of the Autoregressive Distributed Lag model (ARDL) modeling approach to establish the long run relationships between explanatory variables and explained variables in all objectives. According to Pesaran et al. (1999), the long run model as per equation (7) can be derived from the following short run ARDL model:

$$Y_{it} = \beta_0 + \sum_{i=1}^{p} \beta_{1it} Y_{i,t-i} + \sum_{i-1}^{q} \dot{\beta}_{2it} \theta_{i,t-i} + \mu_i + \varepsilon_{it} \quad (8)$$

where $t = 1, 2, \ldots, T$, is the time period; $i = 1, 2, \ldots, N$, is the number of countries, θ_{it} is the (k x 1) vector of explanatory variables for a country i; β_{it} are the (k x 1) coefficient vectors and μ_i represents country fixed

effects. The model above can be re-parameterized as a VECM system. Therefore, from equation (8), we can have the long run model as per equation (6) above,

$$Y_{it} = \gamma_0 + \gamma_1\theta_{it} + \gamma_2\theta_{it} + \gamma_n\theta_{it} + \mu_i + \varepsilon_{it} \quad (9)$$

with $\gamma_0 = \frac{\beta_0}{1-\sum\beta_{1it}}, \gamma_1 = \frac{\sum\beta_{2it}}{1-\sum\beta_{1it}}, \gamma_2 = \frac{\sum\beta_{3it}}{1-\sum\beta_{1it}}, \gamma_n = \frac{\sum\beta_{nit}}{1-\sum\beta_{1it}}$

Using the residuals of the long run model, we can also have an error-correction model,

$$\Delta Y_{it} = \varphi_0 + \sum_{i=1}^{n-1}\varphi_{1it}\Delta Y_{i,t-i} + \sum_{i=1}^{n-1}\dot{\varphi}_{2it}\Delta\theta_{i,t-i} + \delta ECM_{it-1} + \mu_i + \varepsilon_{it} \quad (10)$$

where the error-correction term, ECM_{it-1}, is the residual of the long run model in equation (6) lagged one period,

$$ECM_{it-1} = \mu_{it-1} = Y_{it-1} - [\gamma_0 + \gamma_1\theta_{it} + \gamma_2\theta_{it} + \gamma_n\theta_{it}] \quad (11)$$

The parameter δ is the error-correction parameter implying the speed of adjustment. When $\delta_i = 0$, it indicates the non-presence of relationship among variables in the long run. The expected sign of parameter is to be negative and significant to insinuate the speed of adjustment or convergence to long run equilibrium. The PMG estimator restricts the γ element to be identical across countries, under the following assumptions:

ε_{it} are independently distributed across *i* and *t* with mean 0, variances $\sigma_i^2 > 0$ and finite fourth-order moments. They are also distributed independently of the regressors x_{it}. The assumption of independence between disturbances and regressors is required for consistent estimation of the short run parameters.

For the long run homogeneity, the long run parameters defined $\theta_i = -\gamma_i/\varphi_i$ are the same across the countries, namely θ_i and θ, i = 1, 2, …., *N*. Both the country-specific short run parameters and the common long run coefficients are computed by a maximum likelihood estimation. The parameters of interest are the long run effect and adjustment coefficients. The PMG estimator produces consistent estimates of parameters that are asymptotically normal for both stationary and non-stationary I(1) regressors (Pesaran et al., 1999).

RESULTS AND DISCUSSION

In this section, the results of the study findings are explained starting with the results of the summary statistics, which is a standard part of this type of longitudinal analysis. The results justify the need to use a heterogeneous panel data estimation that permits variations of the short run parameters but restricts the long run coefficients. Looking at the minimum and maximum values of crime rates and the independent variables, the standard deviations of the variables are recognizable. For example, the standard deviation for crime rates, which is also the dependent variable, is 153.08. The minimum and maximum values are 28.13 and 1095.6, respectively. On the other hand, the independent variables display the same pattern of variability with the dependent variable.

Table 1 Summary Statistics of Variables

Variable	Observation	Mean	Standard Deviation	Min	Max
Crime	308	185.49	153.08	28.13	1095.6
Ineq	308	0.312	0.0502	0.22	0.46
ROL	282	0.553	0.494	-0.61	1.391
Imgr	308	5.855	4.568	0.374	17.02
Educ	308	2.859	0.322	1.943	3.535
Unem	308	10.305	4.703	3.3	27.3
Rgdp	304	2.247	3.517	-8.99	10.8

Note: Min is minimum, Max is Maximum.

The unit root test revealed that all variables are stationary at first difference (I(1)) using all the tests of Levin, Lin and Chu t, Im, Pesaran and Shin W-stat as well as ADF Fisher. Nevertheless, using ADF Fisher, we found that the variables are also stationary at level, I(0). However, the first two tests (Levin, Lin and Chu t and

Im, Pesaran and Shin W-stat) did not reveal stationary at level, thus, we concluded that the variables are qualified for the panel cointegration test. Hence, the majority of the tests showed variables are non-stationary at level. So, given the absence of a unit root and the variables being non-spurious at first difference, all variables should be considered as integrated of order one (I(1)). The results of the panel unit root at level and at first difference are shown in Table 2a and 2b, respectively below.

Table 2a Results of Panel Unit Root Tests $X \sim I(1)$

Variable	Statistics Values	P-values	Conclusion	
Crime	Levin, Lin and Chu t	0.9475	0.828	I(1)
	Im, Pesaran and Shin W-stat	0.2333	0.592	I(1)
	ADF Fisher	64.186	0.000	I(1)
Ineq	Levin, Lin and Chu t	1.2321	0.891	I(1)
	Im, Pesaran and Shin W-stat	1.4446	0.925	I(1)
	ADF Fisher	45.759	0.018	I(1)
Imgr	Levin, Lin and Chu t	-0.5202	0.300	I(1)
	Im, Pesaran and Shin W-stat	-0.0220	0.491	I(1)
	ADF Fisher	47.789	0.011	I(1)
Educ	Levin, Lin and Chu t	0.2534	0.600	I(1)
	Im, Pesaran and Shin W-stat	1.4083	0.920	I(1)
	ADF Fisher	174.09	0.000	I(1)
Rgdp	Levin, Lin and Chu t	-4.6423	0.000	I(1)
	Im, Pesaran and Shin W-stat	-3.3043	0.000	I(1)
	ADF Fisher	77.852	0.000	I(1)
ROL	Levin, Lin and Chu t	-0.8881	0.187	I(1)
	Im, Pesaran and Shin W-stat	-2.6432	0.000	I(1)
	ADF Fisher	21.184	0.732	I(1)
Unem	Levin, Lin and Chu t	-2.0530	0.020	I(1)
	Im, Pesaran and Shin W-stat	-1.1734	0.120	I(1)
	ADF Fisher	66.689	0.000	I(1)

Table 2b Results of Panel Unit Root Tests $4X \sim I(0)$

Variable	Statistics Values	P-values	Conclusion	
Crime	Levin, Lin and Chu t	-4.4263	0.000	I(0)
	Im, Pesaran and Shin W-stat	-6.6085	0.000	I(0)
	ADF Fisher	97.589	0.000	I(0)
Ineq	Levin, Lin and Chu t	-3.9670	0.000	I(0)
	Im, Pesaran and Shin W-stat	-6.8123	0.000	I(0)
	ADF Fisher	100.40	0.000	I(0)
Imgr	Levin, Lin and Chu t	-1.4754	0.070	I(0)
	Im, Pesaran and Shin W-stat	-2.2326	0.012	I(0)
	ADF Fisher	42.516	0.000	I(0)
Educ	Levin, Lin and Chu t	-3.9866	0.000	I(0)
	Im, Pesaran and Shin W-stat	-2.9189	0.001	I(0)
	ADF Fisher	60.554	0.000	I(0)
Rgdp	Levin, Lin and Chu t	-11.784	0.000	I(0)
	Im, Pesaran and Shin W-stat	-11.488	0.000	I(0)
	ADF Fisher	167.09	0.000	I(0)
ROL	Levin, Lin and Chu t	-6.2019	0.000	I(0)
	Im, Pesaran and Shin W-stat	-5.1930	0.000	I(0)
	ADF Fisher	74.587	0.000	I(0)
Unem	Levin, Lin and Chu t	-3.4728	0.000	I(0)
	Im, Pesaran and Shin W-stat	-4.4164	0.000	I(0)
	ADF Fisher	67.099	0.000	I(0)

Table 3 Results of Panel Cointegration Tests

Test	Statistic	P-value	Weighted Statistic	P-value
		Intercept		
Within Dimension				
Panel v-Statistic	-1.0676	0.8572	-1.52645	0.9366
Panel rho-Statistic	3.2014	0.9993	2.89477	0.9981
Panel PP-Statistic	-1.8479**	0.0323	-2.67737***	0.0037
Panel ADF-Statistic	-2.7275***	0.0032	-3.08789***	0.0010
Between Dimension				
Group rho-Statistic	4.2140	1.0000		
Group PP-Statistic	-4.0783***	0.0000		
Group ADF-Statistic	-3.7741***	0.0001		
		Intercept & Trend		
Within Dimension				
Panel v-Statistic	-1.0099	0.8437	-1.73989	0.9591
Panel rho-Statistic	3.9467	1.0000	3.88568	0.9999
Panel PP-Statistic	-6.4443***	0.0000	-5.55624***	0.0000
Panel ADF-Statistic	-6.4812***	0.0000	-5.12919***	0.0000
Between Dimension				
Group rho-Statistic	5.1018	1.0000		
Group PP-Statistic	-11.517***	0.0000		
Group ADF-Statistic	-5.8450***	0.0000		

Estimation based on Pedroni Residual Cointegration, N = 14 and T = 22

Table 3 above contains the results of panel cointegration for all the variables in Table 6 based on Pedroni residual cointegration. There are seven tests with eleven outcomes and the null hypothesis is that there is no cointegration among variables, while the alternative hypothesis is that cointegration does exist among variables. Two trend assumptions are made, namely intercept and intercept with trend. Six of the outcomes revealed that the variables are cointegrated by having their respective probability values (p-values) less than 0.05. This means that the long run relationships exist between independent macroeconomic variables and property crime rates, thus, the need to test the long run coefficient using PMG estimator. The null hypothesis is hereby rejected and, therefore, we failed rejecting the alternative hypothesis.

Diagnostic Test

In this study, three different diagnostic tests have been conducted to adequately confirm how valid our dataset is. First, we test the variables to confirm whether multicollinearity exists or not. Multicollinearity is a situation in which some of the explanatory variables in a multiple regression model became thoroughly correlated to one another. This can be detected using variance inflation factor (VIF), if the value of the VIF is less than 4.0, then there is no problem of multicollinearity among the variables. Second and third diagnostic tests are conducted to check for heteroscedasticity and autocorrelation problems respectively. Table 4 contains the results of the multicollinearity test, which reports that there is no multicollinearity problems, hence, the independent variables do not correlate with one another in the multiple regression model. This is indicated by having the value of VIF less than 10.

Table 4 Results of Multicollinearity

Model	**VIF**	**1/VIF**
Ineq	2.68	0.372509
Educ	2.63	0.380680
ROL	1.39	0.721999
Imgr	1.13	0.882011
Rgdp	1.12	0.889853
Unem	1.02	0.978321
Mean VIF	**1.72 < 4**	**No multicollinearity**

Note: VIF is Variance Inflation Factor

On the second and third tests, the results have revealed a first order heteroscedasticity and serial correlation problems. However, these problems have been fixed and the current outcome showed the absence of both autocorrelation and heteroscedasticity problems. This is indicated by the probability value (P-value) being greater than 0.05. The results are presented in Table 5 below.

Table 5 Results of Autocorrelation and Heteroscedasticity

P/Crime	Coefficient	Robust Std. Err.	t	P-value	[95% Conf.	Interval]
Ineq	-0.71082	1.55706	-0.46	0.656	-4.07466	2.65300
Educ	-0.50588	0.59702	-0.85	0.412	-1.79568	0.78391
Imgr	0.00445	0.03675	-0.12	0.905	-0.07494	0.08385
Rgdp	-0.02666	0.01673	-1.59	0.135	-0.06283	0.00949
Unem	0.02736	0.02714	1.01	0.332	-0.03128	0.08601
Rol	0.47351	0.27977	1.69	0.114	-0.13090	1.07793

Note: P-values greater than 0.05, which means no autocorrelation and heteroscedasticity problems

As mentioned earlier, 14 countries in the Southern and Eastern European regions were used in this study. The results of the PMG estimator are presented in Table 6 below. It reports the estimated results of the effect of income inequality on the property crime rate (objective of the study). Instead of Mean Group (MG), the study used PMG estimator which restricts all long run coefficients to be homogeneous while permitting dynamics in the short run coefficients. This can yield lesser standard errors and then improves significantly the speed of adjustment measure with a negative sign of the estimated coefficients of the long run. Furthermore, the long run homogeneity restriction imposed for all slope coefficients is hereby accepted at the predictable level of Hausman test statistics. The restriction of the long run coefficients to be homogenous affected both the sign and the significance level of the long run coefficients, as revealed by the estimated results.

Table 6 Results of the Long run Estimations

Long run Model	Column 1	Column 2	Column 3
Ineq	-0.159	1.148**	0.141***
	(0.605)	(0.514)	(0.035)
ROL	---------	-1.220***	-0.652***
		(0.404)	(0.162)
Educ	2.293*	6.317***	-0.708***
	(1.209)	(1.447)	(0.360)
Unem	0.434***	0.408***	0.047***
	(0.087)	(0.109)	(0.007)
Imgr	0.011	-0.341***	-0.056***
	(0.027)	(0.066)	(0.019)
Rgdp	0.073***	0.097***	-0.030***
	(0.018)	(0.014)	(0.006)
*Ineq*ROL*	--------	--------	-0.203***
	--------	--------	(0.033)
ECM	-0.300***	-0.171***	-0.415***
	(0.091)	(0.063)	(0.189)
HLH	0.9992	0.9992	0.7695
Observation	252	252	268
Countries	14	14	14

Note: ECT= Error correction term; HLH= Hausman long run homogeneity; ***, ** and * are 1%, 5% and 10% significance levels respectively; standard errors in (), Lag selection: ARDL (1,1,1,1,1,1,1,1), selected based on AIC.

In Table 6 above, column 3 revealed that in the long run, the income inequality and rule of law positively and negatively affect the level of property crime rate in the 14 Southern and Eastern European countries, respectively. A 1 percent increase in the income inequality will trigger a 0.141 percent increase in the property crime rate, while a 1 percent increase in the quality of rule of law decreases the property crime rate by 0.652 percent. The relationships are significant at a 1 percent level. The unemployment rate is found to have a positive effect on the property crime rate in these regions. In the long run, a 1 percent increase in the unemployment rate will have a 0.047 percent increase in the rate of property crime victims. In the same column 3, the interaction of income inequality and rule of law shows a negative relationship with the property crime, which suggests that the income inequality will not affect the property crime rate in which there is a strong rule of law.

The long run positive relationship identified by this study between income inequality and property crime is in line with the expectations of the study. Meanwhile, the theoretical expectation on the relationship between rule of law and crime rate is that the rule of law tends to reduce the rate of crime, and so, the long run negative impact of the rule of law on the property crime revealed by this study is in line with the expectations of the study. This suggests that the income inequality in Europe, particularly, in the southern and eastern parts induces the property crime rate as those hit by the inequality would seek for compensation by all means, while a strong rule of law reduces the property crime rate in the regions. Moreover, the degree of their effects are quite reasonable and meaningful. The long run positive and significant effect of unemployment revealed in this study conformed to the expectations of the study and the findings of Ishak and Bani (2017), Brenner (1979), and the findings of Huhta (2012). This means that as more and more people became unemployed, they tend to think of a way of earning income illegally.

The real GDP per capita growth rate's coefficient reports a positive impact on the property crime rate. The result contradicts the expectation of this study. However, the positive effect of economic growth on crime may be possible through the income distribution; if the benefits from growth are not evenly distributed, it can have a negative effect on the distribution of income. This will enlarge the level of income inequality and in turn, induces the crime rate. The interactive term of income inequality and rule of law as specified in equation (7) of this study reports a negative and significant impact on the property crime rates. This means that in the presence of strong quality of the rule of law, the income inequality impacts less on the property crime. It estimates the effect of income inequality when the quality of the rule of law in these regions is strong. The error correction term (ECT) for the estimates is negative and significant and the Hausman test is greater than 0.05, which rendered the estimation of the pooled mean group (PMG) valid.

In the estimation, the PMG estimator controls the problem of endogenous regressors that are within the framework of ARDL models, especially if the regressors are I(1). Pesaran et al. (1999) and Golem and Perovic (2014) have also lamented the fact that the PMG estimator controls the endogeneity problem. In spite of these evidences, a diagnostic check is conducted by this study using Dynamic Ordinary Least Squares (DOLS) estimator; the results of the estimate are expected to have the same long-run coefficients' sign with the PMG estimate and are also expected to be significant. If the DOLS estimate corresponds with that of the PMG, then the issue of endogeneity and autocorrelation is hereby addressed. This is because the endogeneity problem will be taken care of automatically by the DOLS estimator. The results of the diagnostic checks are presented below with the property crime as the dependent variable.

Table 6 Results of the Robustness Check

Long Run Model	**Long run Coefficients (DOLS)**	
	Lead=1	**Lag=1**
Ineq	5.488**	
	(2.252)	
ROL	-0.602**	
	(0.258)	
Educ	-5.658***	
	(1.964)	
Unem	0.268***	
	(0.053)	
Imgr	-0.734***	
	(0.248)	
Rgdp	-0.009*	
	(0.005)	
*Ineq*ROL*	-0.169**	
	(0.073)	

Note: Values in Parenthesis (()) are Standard Errors, Dependent Variable: Property crime

The above estimated results of the DOLS for the effects of the independent variables on the property crime rate agreed with the estimated results of the PMG in Table 3, model three in column 3 above. Therefore, an inference is hereby drawn that there is an absence of endogeneity problem in the regressors.

CONCLUSIONS

The foremost objective of this paper is to examine the effects of income inequality on the property crime rate in 14 (mostly emerging) Southern and Eastern European countries by using a pooled mean group (PMG) estimator. The study incorporates the rule of law and interacts with the income inequality to further explain the relationship between income inequality and property crime. Other variables like unemployment, level of education, and immigrant status were also considered as independent variables. The results of the findings provide an evidence of the existence of the long run relationship between property crime and most of the explanatory variables. First, the results confirm the general strain theory that high level of income inequality induces the crime rate; the positive relationship between income inequality and property crime remains significant across the 14 sampled Southern and Eastern European countries. The beliefs of the people affected by income differences is that committing crime is the only workable way to seek compensation of the deprivation. Secondly, the rule of law proves the apriori expectation of this study that a strong rule of law reduces the property crime level, and it is also in line with the theory that a strong rule of law has the tendency to protect lives and property including property rights. While a poor quality of rule of law shrinks the trust of the people on the government (Harrison and Rodriguez, 2009). The interaction of income inequality and rule of law shows a negative relationship and this further explains that with a strong rule of law, the income inequality will have less positive impact on the property crime in Southern and Eastern Europe. The unemployment and level of education respectively affect the property crime positively and negatively.

The recommendations that have been drawn regarding the results of our study are, first of all, not permitting us to make a sweeping statement on other regions of the world as the data and the sample size is limited to only 14 Southern and Eastern European countries. It is suggested, therefore, that studies on other regions are hereby recommended. It is also important to note that this study does not allow us to come to a certain conclusion about the cause and effect; we assume reasonably that the income inequality and rule of law are not mainly triggered by the property crime. Furthermore, the need to halt the recent increase in the income inequality and effort to reduce its effects is highly recommended. Strengthening the quality of rule of law is helpful, and, based on its additional mitigating relationship to the property crime is also recommended. Lastly, the provision for job opportunities to reduce unemployment is hereby recommended by this study. These actions will serve as a way towards reducing the rate of property crime in these countries.

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