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Relationship between Income Inequality and Property Crime in the Nordic and Western Europe: A Pooled Mean Group Approach

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Abstract

Income inequality is a menace bordering almost every part of the world, not to mention the less developed countries. In Europe, for instance, where most of developed and emerging countries situated, inequality of income is becoming a major issue just as in other regions such as Africa, Asia and Latin America. Recent research on the role of income inequality in explaining cross-national property crime rates is inconsistent, disregards the role of the rule of law. This study examined based on the view of the theory, which argued that income inequality induces crime rates and whether or not to validate the assertion made by this theory, taking into consideration 17 countries of the Northern and Western Europe form 1996 - 2014. A pooled Mean Group (PMG) Approach is used to estimate variables. The study finds differences from earlier findings, however, corroborates the main theory. It is discovered that income inequality has a positive effect on property crime in the Nordic and Western Europe, which appears to be an indication of seeking compensation by those hit hard by the inequality. Hence findings are argued within the framework of strain theory. , pooled mean group, Northern and Western Europe

Keywords: Income inequality, property crime, the rule of law
JEL classification: F40, F43, F45, F49

Contribution to/Originality Knowledge This study contributes to the body of knowledge by sightseeing emerging issue of income inequality discovered in recent years in Europe. The study offers an understanding of the perception of Europeans and contribute to body of knowledge with different findings that will pave the way for further studies in the area.

1.0 Introduction

Income inequality is a menace bordering almost every part of the world, not to mention the less developed countries. In Europe, for instance, where most of developed and emerging countries situated, inequality of income is becoming a major issue just as in other regions such as Africa, Asia and Latin America. Recent researches on the role of income inequality in explaining property crime, have overlooked the importance of the rule of law and their findings often varying. Europe is a region of relatively more billionaires. However, the fraction of people at threat of poverty is also on the increase, (Oxfam report, 2015). It was argued that the growing inequality of income is an invention of globalization, intensified rivalry or competition in the marketplace, corruption, concentration on cost saving and maximization of profit, advancements in technology, as well as environmental disasters. The continent of Europe is relatively doing well in terms of GDP growth; the international monetary fund (IMF) reported in 2016 that the nominal GDP of the EU stood at 16.5 trillion euro; an amount equals 22.8 percent of global GDP (nominal). Countries in the EU, if treated as a single country will be the second largest economy. The continent has the highest of both domestic and foreign investment, totaling $5.1 trillion and $9.1 trillion respectively as of 2012, (The World Factbook, 2016). In 2015, Europe, particularly in the EU-28, the public debt recorded at 85.2 percent of its GDP, (Eurostat, 2016).

Nevertheless, the region is known for having issues like disparity in income distribution and rising property crime rate. Its average Gini coefficient as of 2015 was 0.31, (Eurostat, 2016) with an

unemployment rate of 9.5 percent, (The World Factbook, 2016). The region possesses more property than any other region with a relatively high level of property crime (Eurostat, 2014).

Studies on issues related to inequality of income forecast that the problem will remain noticeable in the coming years. The Economic Forum (2014) said in its economic agenda that more concern must be placed on efforts to check increasing global economic risk flexibility in the wake of severe structural unemployment and widening disparities in income. The assertion here is that disparity in income distribution is not an issue facing the developing countries alone, but also an issue burdening the emerging and the developed countries as well. In Europe, particularly the European Union (EU) countries, inequality of income is increasing. Although, it is a region of more billionaires than ever before, the percentage of people facing the threat of poverty is also on the increase (Oxfam report, 2015). Piketty (2003) asserts that growing inequality of income is a byproduct of globalization, intensified rivalry or competition in the marketplace, corruption, a concentration on cost savings and the maximization of profit, advancements in technology and environmental disasters.

The distribution of total generated income amongst individuals in a given economy and what the determinants of such distribution have been the debate question. The concept of inequality means comparability among elements typically centered on precise features that can be measured using indices or indicators. The share of income between rich and poor in most countries in the northernand western regions of Europe is on the increase since 2008, (Eurostat, 2015). Between 2004 and 2013, countries like Latvia, Luxembourg, Austria,and Sweden have recorded an increase in Gini index, (Eurostat, 2015). Lithuania and the United Kingdom recorded the 0.35 and 0.32 index, respectively.It shows that most countries in these partsof Europe are unable to moderately reduce the level of income inequality for over a decade (see Figure 1). Less than 10 percent of the wealth in these countries is controlled by the poorest, with half of the total number of population of the regions, (World Economic Forum, Report, 2015). Although income is not always expected to be the same, however, rising inequality is a problemif it is accompaniedby social unrest such as crime, (Agnew, 1992).

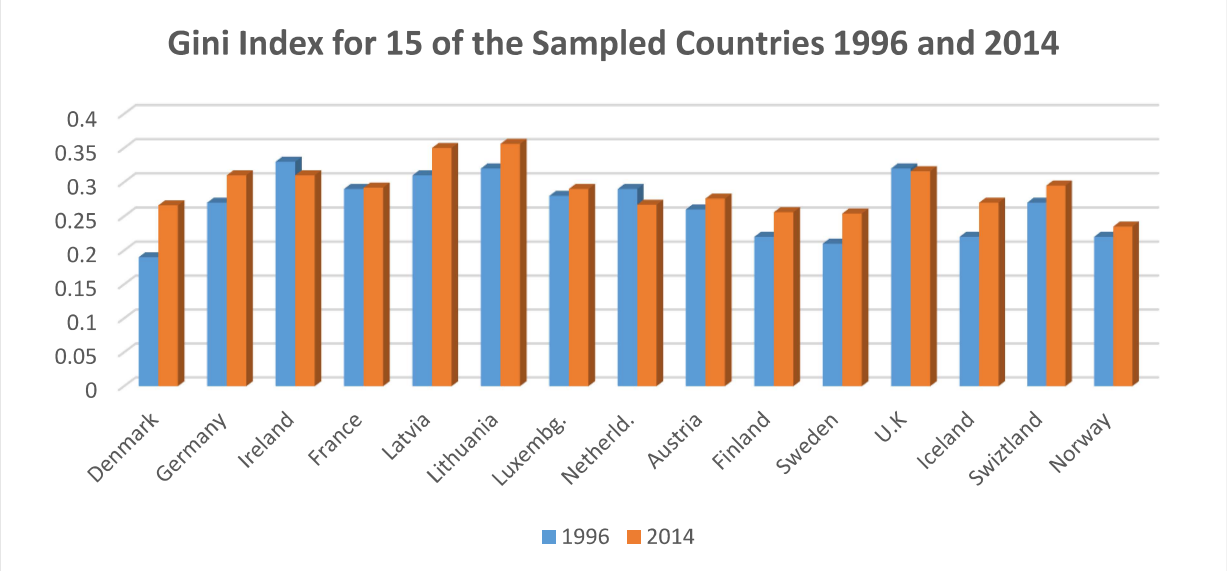

Figure 1 Gini Index for the Sampled Countries (1996 – 2014) Source: World Bank's WDI

Property crime has been the most increasing in Europe with a percentage point of 14% since 2007, (Eurostat, 2015). Equally, the percentage share of property crime to total crime in Europe as perEurostat (2015) report was 83 percent.Countries in these regions including the developed ones such as

Luxembourg, Sweden, France, Germany, Denmark, Belgium, Ireland,and Austria have been recording an increase in the rate of property crime between 2008 and 2014, (Eurostat, 2015). A report by the United NationsOffice on Drugs and Crime (UNODC) in 2011 spelled-out that the rate of crime, especially property crime is expected to increase by more than 20 percent every year across Europe due to rising inequality and the at-risk of poverty in the continent. For example, Sweden has recorded an increase in the rate of property crime from 193.23 per 100,000 inhabitants, in 2008 to 434 per 100,000 inhabitants in 2014. Belgium recorded some 105,060 cases of burglary with arate of 941.26 victims per 100,000 populations. Germany registered 437,520 cases, and 533.43 victims per 100,000 populations. Denmark recorded 78,897 cases of burglary and 1,408.21 as a rate per 100,000 populations. Austria, Switzerland, England & Wales, Luxembourg, and France have their rates of burglary per one hundred thousand populations at 1,049.51, 854.95, 780.84, 746.54 and 581.83 respectively. The rates for theft crime is also high in most of the countries under study; in Belgium, the rate of theft per one hundred thousand inhabitants is 2,064.54, Germany; 2291.5, Denmark; 3,357.98, Netherlands; 3,815.53, Austria; 1761, England & Wales; 2,337.50, Luxembourg; 1,924.26 and Switzerland; 1,828.82, (Eurostat, 2016).

The general strain theory of 1992 established that income inequality encourages crime. Earlier findings and empirical evidence confirmed that inequality induces crime and fear of crime, (see,for example, Vauclair and Bratanova, (2016). It influences criminal behaviors especially towards theft and burglary which are commonly committed by the disadvantaged, desperate persons, and not the professional criminals. According to the Gini Index for 2013, most of the EU countries have experienced an increase in income disparity in recent years. For instance, the at-risk-of-poverty rate in the EU-28 has risen from 16.9 percent in 2011 to 17.2 in 2014. In Latvia, about one-fifth of its population is viewed as being at-risk-of-poverty, (Eurostat, 2016). Within this period, property crime (mostly burglary and theft crimes) reported highest in most of the Nordic and Western European countries. Figure 2 presented a one-on-one relationship between income inequality and property crime, which revealed a positive correlation.

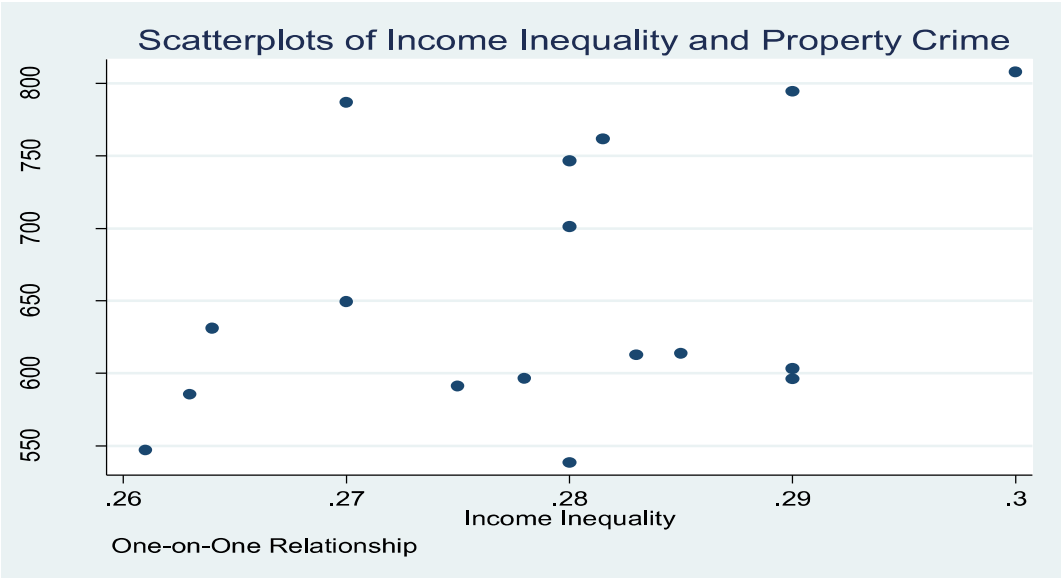

Figure 2. Scatterplots of Income Inequality Property Crime in 17 Sampled Countries

Countries that experienced rising income disparity have also noticed an increase in the number of victims of crime, (UNODC, 2011). The question here is that, is the rising income inequality in recent years behind the increase in property crime rates in these European countries? Thus, this study is aimed at examining the relationship between income inequality and property crime in 17 countries of northern

and western parts of Europe. Findings on the effect of income inequality on property crime by previous studies have revealed mixed results, (see Kelly (2000), Huhta (2012)). Moreover, none of these studies focused on Europe or the Nordic and western parts of Europe. However, Vauclair and Bratanova (2016) have examined the relationship between income inequality and the fear of crime across Europe. The fear of crime is, still, not the same with property crime. This study can include the rule of law as none of the previous study, to my knowledge have done that. The idea is that one of the functions of the rule of law is to ensure the protection of lives and properties and to deepen the explanations on the effect of income inequality by interacting them (income inequality and the rule of law). The second section of this study focusses on literature review, section three is the methodology, sections four and five highlight the results discussion and conclusion respectively

2.0 Literature Review

2.1 Theoretical Literature

In 1938, Robert Merton K. advocated that as poorer people notice inequality, they feel that commitment to social norms is reduced and come to see crime as more acceptable. In 1966, Runciman first addressed the possible correlation between inequality and crime in his book titled "Relative Deprivation and social justice; based on the theory of deprivation which referred to common sense notions of envy that increases the feeling of dispossession and unfairness, which leads poorer people the use of crime to reduce economic injustice. Gary Becker (1968) posited that places with pronounced income inequality are more likely to have high rates of crime. The wider the socio-economic gap according to Becker's assumptions, the more gains potential criminals perceived, the more frustrated poorer criminals the society will be. In 1992, Robert Agnew advocated that there is a possible correlation between income inequality and crime rate as a way of seeking revenge against negative stimuli such as inequality among households and individuals.

Following Runciman (1966), various literature has both supported the idea that a strong link exists between income inequality and crime rates and made inferences of no correlation between the two. See Krohn (1976), Doyle, et al. (1999) and Kelly (2000) for the negative effect of income inequality and crime rate. Some also revealed a non-meaningful relationship, see, for example, Baharom and Habibullah (2009). Although, this study uses property crime which comprises theft, burglary, and burglary of private residential premises, however, most of the reviewed literature here are on other categories of crime.

2.2 Empirical Literature

The review of literature in this study is done on all sorts of crime that can be accessed because the literature on property crime, in particular, was not that much. Recent studies on income inequality and crime rate include among others; a study by Ishak and Bani (2017) revealed that GDP per capita and unemployment and population density determine property crime in four developed states of Malaysia. Vauclair and Bratanova (2016) have based on their holistic approach studied the fear of crime across Europe by studying the predictors at various levels. The authors used data collected via computer-based personal interview to 56,752 inhabitants in 29 countries across Europe, over a period covering 2008 – 2010. They found that 90.9 percent of the respondents claimed to have a fear of crime because of individual differences; individuals with higher inequality of income in their societies are found to be more fearful, and older people, disabled as well as women report a greater fear of crime. Shih (2016) investigates the relationship between total crime, larceny, and violent crime and income inequality. The study covers a panel of 20 cities in Taiwan throughout 17 years, 1998 – 2014. Pooled OLS and fixed effect models are used to examine the existence of these three major types of crimes in Taiwan. The results of the empirical findings show that income inequality is positively related to total crime. In other

words, income inequality increases aggregate crime in Taiwan. It further shows that income inequality is negatively associated with larceny and violent crime. Li, McAfee, and Phadke (2016), examine the relationship between income inequality and robbery and property theft, using Gini index as a measure of income inequality within counties in the United States, throughout five years. The results of their findings supported their proposed hypothesis that income inequality induces the amount of violent crime. Enamorado et al. (2016) examined the effect of income inequality on crime rate using data on 2000 + municipalities in Mexico. Their estimates show that income inequality is positively related to violent crime; a one-point increase in income inequality will explosively trigger a 36 percent increase in drug-related homicides per 100,000 populations.

Roh and Lee (2013) have found that income inequality determines robbery victimization, while ethnic heterogeneity enhances burglary victimization significantly. But a high level of social capital according to Roh and Lee reduces the possible robbery victimization. The study uses multilevel analysis on data obtained for 57 nations for 14 years, 1992-2005. Huhta (2012) has tested the relationship between income inequality and property crime in Finland, using dynamic GMM model. The findings revealed that a positive relationship exists between inequality and property crime, especially theft crime. However, the relationship between income inequality (Gini coefficient) and violent crime does not exist. He suggested that in studying crimes and their determinants, a separate work should be done for each category of crime and its determinants. Menezes et al. (2013) utilises the ordinary least squares (OLS) and the spatial model in their study to examine the correlation between inequality and homicides. They found that income inequality is associated with homicides rate in the urban neighbourhood in Brazil. The study asserts that areas with higher inequality record higher rates of homicides.

Other studies that found a positive and significant effect of income inequality on crime include; Choe (2008), Brush (2007), Demombynes and Ozler (2005), Fajnzylber, et al. (2002), Imrohoroglu, Merlo and Rupert (2000) among others.

3.0 Methods

This study uses Pooled Mean Group (PMG) estimator developed by Pesaran et al., (1999) in achieving the objectives of the study. Preliminary tests have been conductedbefore PMG estimation, such as testing for the panel unit root, panel cointegration test as well as diagnostic tests to check for multicollinearity and autocorrelation in the dataset. The PMG is preferred by this study rather than the standard panel approach because PMG is an intermediate estimator, it allows short term parameters to differ but imposes equality of the long term coefficients between groups. On the other hand, the standard panel approach is derived from a usually small number of observations over time and large number of cross-sectional units. While the PMG allows both T, number of time series observations and N, number of groups to be large and to have same order of magnitude, hence the selection of the pooled mean group.

3.1 The Data

Income inequality otherwise known as Gini index is measured from 0 – 1 with 0 having maximum equality and 1 means maximum inequality. The source of the data is the World Bank's World Development Indicator (WDI),and it is expected to have a positive impact on property crime. The rule of law is considered as an indicator of governance in this study. It is measured from -2.5 – 2.5; where higher values mean better governance and the rule of law index is expected to impact negatively on property crime. The data is taken from the World Bank's World Development Indicator. Property crime is described as total property crime that includes theft, burglary, burglary of private residential premises and motor vehicle theft. It is measured as the number of victims per 100,000 population; it is calculated

as the total property crime divided by the population, times 100,000. The source of the data is Eurostat. Immigrants and education level, measured as the percentage of foreigners to total population and human capital index based on years of schooling per person, were taken from the Eurostat and Penn World Table 8.1 respectively. Unemployment, measured by the total number of unemployed as a percentage of the totallabour force and real GDP growth measured by the per capita annual percentage growth were taken from the international labourorganisation (ILO) and the World Bank's WDI respectively. All data covered the period of 21 years, from 1996 – 2016.

3.1.1 Panel unit root test

There are three different unit root test conducted by this study; these are the Levin, Lin,and Chu t (2002), the Im, Pesaran and Shin W-stat (2003) as well as the ADF Fisher test Proposed by Maddala and Wu (1999); all these are termed as the panel unit root test, generalised from single time series, (Baltagiet al. 2005). Theoretically, however, according to Baltagi et al.(2005), they are known as the multiple series unit root test applied to the panel data structure.

$$X_{it} = \rho_i X_{it-1} + Y_{it}\delta_i + e_{it} \qquad (1)$$

Where I = 1,2,.,.,Ncross-section unit observed over period, t = 1,2,.,.,T

The Y_{it} denotes the exogenous variables in the model, including any fixed effects or individual trends, ρ_i are the autoregressive coefficients, and the errors e_{it} are assumed to be mutually independent idiosyncratic disturbance. If $|\rho_i| < 1$, X_i is said to be softly stationary. On the other hand, if $|\rho_i| = 1$, then X_i contains a unit root.

3.1.2 Panel Cointegration test

Panel cointegration testis applied in this study to test for the existence of a long-run relationship among the variables under study. The condition is that all variables under study must be integrated of order one, I(1), (Pedroni, 1999). This means that all the variables should be at most, stationary at first difference, I(1). According to Pedroni (1999), the panel cointegration statistics support the version of weak PPP hypothesis. In general form, the following regression model will be considered.

$$y_{it} = \alpha_i + \theta_i t + \gamma_t + \partial_{it}\beta_i + e_{it} \qquad (2)$$

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

$\partial_{it}$is a vector for each member i, here, we refer to scalthe ar case, ∂_{it}, to simplify the notation and show any condition in which generalisation is not immediate to the vector case, (Pedroni, 1999). So the variables y_{it} and ∂_{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 e_{it} will also be I(1). Hence the (1) is referred to as spurious regression. The parameters α_i and θ_i allow for 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.

3.1.3 Diagnostic Tests

In this study, also, diagnostic tests have been conducted to adequately confirm how valid our dataset is. Firstly, we tested for the multicollinearity among the variable; 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 the variance inflation factor (VIF). The second diagnostic test is conducted to check for the problem of autocorrelation. Autocorrelation also knew as the serial correlation is informal, a similarity amongst observations as a function of the time lag between them. The analysis of autocorrelation is a mathematical tool for finding repeating patterns; this is indicated by the probability value (P-value) being greater than 0.05, to show that there is no autocorrelation problem.

3.2 Pooled mean group (PMG) estimator

The pooled mean group estimation entails the pooling and averaging of parameters. It is often regarded as an intermediate estimatorbecause it occupies a position between the mean group (MG) and the dynamic fixed effects (DFE); the DFE does not allow slope coefficients but does not restrict intercepts to differ across countries. The PMG has the lead to estimate long run 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:

$$y_{it} = \sum_{j=1}^{p} \exists_{ij}\, y_{i,t-j} + \sum_{j-1}^{q} \dot{x}_{ij}\, \gamma_{i,t-j} + \epsilon_i + e_{it} \qquad (3)$$

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

$$\Delta y_{it} = \delta_i\left(y_{i,t-1} - \dot{\beta}_i \gamma_{it}\right) + \sum_{j=1}^{p-1} x_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \dot{x}_{ij} \Delta \gamma_{i,t-j} + \epsilon_i + e_{it} \qquad (4)$$

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

A country's long-run parameter which is given by $\beta_i$and δ_i, is the error correction parameter. When $\delta_i = 0$, it signifies non-existence of association amongst variables in the long run. The expected sign of parameter is to be negative and significant to validate the speed of adjustment or convergence to long run equilibrium. The PMG estimator limits the component of β to be identical across countries based on the following assumptions.

e_{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 regressorsγ_{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 required that $\theta_i < 0$, which infers the existence of long run association between y_{it} and γ_{it}defined by $y_{it} = -\left(\frac{\dot{\beta}_i}{\delta_i}\right)\gamma_{it} + \eta_{it}$ where η_{it} is a stationary process. This assumption also certifies that the order of integration of y_{it} is at most equal to that of γ_{it}.

On long run homogeneity, the parameters defined,$\theta_i = -\beta_i/\delta_i$, are unchanged 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 maximum likelihood estimation. The parameters of interest are the long

run effect and adjustment coefficients. PMG produces consistent estimation of parameters that are asymptotically normal for both stationary and non-stationary I(1) regressors, (Pesaran, et al., 1999).

3.3 The model

According to Agnew (1992), Neumayer (2005) and as conceptualizes by North (1993), our model, will be:

$$Cri_{it} = a_0 + \beta_1 Ineq_{it} + \beta_2 RoL_{it} + \beta_3 gwth_{it} + \beta_4 mgr_{it} + \beta_5 Une_{it} + \beta_6 edu_{it} + \mu_{it} \quad (5)$$

where *Cri* is property crime rate, *Ineq* denotes inequality of income, RoLdenotes rule of law, *gwth* is real GDP per capita growth, *Une* is unemployment rate, and *Edu* is level of education attainment, μ_i,is the error term. The sign of β_1 is expected to be positive to show that income inequality is positively associated with property crime, while the coefficient of β_2 is expected to be negative which means that better quality of rule of law reduces the rate of crime, (Neumayer, 2005, Neumayer, 2003). The β_3 is also expected to be negative which means that when per capita income increases, crime rate reduces, (Neumayer, 2003). The signs of β_4 and β_5 are expected to have positive relationship with crime rate; this is because high percentage of immigrants and unemployment rate induce crime rate, (Huhta, 2012). The last coefficient β_6 is expected to have a negative sign to show that higher levea l of education among individuals lowers the level of crime rate, (Brilli & Tonello, 2014).

As the rule of law guarantees protection of lives and properties, this study, following the work of Brambor, et al. (2005), interacts income inequality and rule of law, to further extend the explanation of the effect of income inequality on property crime in the presence of good quality of rule of law. To do that, an interactive term of income inequality and the rule of lawhas been introduced in equation six below:

$$Cri_{it} = a_0 + \beta_1 Ineq_{it} + \beta_2 RoL_{it} + \beta_3 (Ineq_{it} \times RoL_{it}) + \beta_4 gwth_{it} + \beta_5 mgr_{it} + \beta_6 Une_{it} + \beta_7 edu_{it} + \mu_{it} \quad (6)$$

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

In equation (6) above, β_1 and β_2 will also be interpreted, this is because according to Brambor, et al. (2005) it is proper to have a positive/negative and significant coefficient of β_1 and β_2, hence, rule of law as the mediator is expected to reduce the effect of income inequality on crime rate. Therefore β_3 is expected to be marginally negative. The real GDP per capita growth (β_4) is expected to be negatively associated with lower the crime rate. The signs of β_5 and β_6 are expected to be positive to show that high percentage of immigrants and unemployment rates induce crime rate, (Huhta, 2012). The sign of β_7 is to be negative to show that higher lea vel of education reduces crime rate, (Brilli & Tonello).

Property crime is dynamic, (Fajnzylber et al. 2002), to capture the dynamic effects, equation six is transformed to an Autoregressive Distributed Lag (ARDL) form, if and only if the explanatory variables in equation 6 are I(1) and integrated for individual countries. Maximizing the possibility of recuperating the true lag length and minimizing the likelihood of underestimation in small sample size, Akaike Information Criterion (AIC) outperforms Schwarz Bayesian Information Criterion (SBIC), (Liew, 2004). Therefore, if we assumed a maximum lag length of 1 based on AIC, the dynamic panel specification of the ARDL equation can be given as below:

$$Cri_{it} = a_1 + \lambda_i Cri_{it-1} + \beta_{10i} Ineq_{it} + \beta_{11i} Ineq_{it-1} + \beta_{20i} RoL_{it} + \beta_{21i} RoL_{it-1} + \beta_{30i} gwth_{it} + \beta_{31i} gwth_{it-1} + \beta_{40i} mgr_{it} + \beta_{41i} mgr_{it-1} + \beta_{50i} Une_{it} + \beta_{51i} Une_{it-1} + \beta_{60i} edu_{it} + \alpha_{61i} edu_{it-1} + \mu_{it} \quad (7)$$

The error correction model can be written as follows:

$$\Delta Cr_{it} = \alpha_i \left(Cri_{it-1} - \beta_{0i} - \beta_{1i} Ineq_{it} - \beta_{2i} RoL_{it} - \beta_{3i} gwth_{it} - \beta_{4i} mgr_{it} - \beta_{5i} Une_{it} - \alpha_{6i} edu_{it} \right) + \theta_{1i} \Delta Ineq_{it} + \theta_{2i} \Delta RoL_{it} + \theta_{3i} \Delta gwth_{it} + \theta_{4i} \Delta mgr_{it} + \theta_{5i} \Delta Une_{it} + \theta_{6i} \Delta edu_{it} + \mu_{it} \quad (8)$$

$$\alpha_i = -(1-\lambda); \beta_{1i} = \frac{\theta}{1-\lambda}; \beta_{1i} = \frac{\theta_{10i} + \theta_{11i}}{(1-\lambda_i)}; \beta_{2i} = \frac{\theta_{20i} + \theta_{21i}}{(1-\lambda_i)}; \beta_{3i} = \frac{\theta_{30i} + \theta_{31i}}{(1-\lambda_i)}; \beta_{4i} = \frac{\theta_{40i} + \theta_{41i}}{(1-\lambda_i)}; \beta_{5i} = \frac{\theta_{50i} + \theta_{51i}}{(1-\lambda_i)}; \beta_{6i} = \frac{\theta_{60i} + \theta_{61i}}{(1-\lambda_i)};$$

4.0 Results and Discussion

The discussion of the results is started with the explanation of the results of the panel unit root test. Three kinds of panel unit root tests have been conducted, as mentioned in the methodology section which revealed that not all the variables under study, are stationary at level (I(0)), but all are stationary at first difference, (I(1)). Hence, we conclude that the next test should be conducted which is a panel cointegration test, after confirming that the variables are non-spurious. Table 1 reported the results of the panel unit root tests both at the level and at first difference.

Table 1 Results of panel unit root tests

		At Level: I(0) X ~ I(1)			First Differenced I(1) 4X ~ I(0)		
Variable	Statistics	Values	P-values	Conclusion	Values	P-values	Conclusion
Cri	Levin, Lin, Chu t	-2.6282	0.004	I(1)	-5.3392	0.000	I(0)
		-0.5826	0.280	I(1)	-6.0377	0.000	I(0)
	Im, Pesaran, Shin t	42.9354	0.140	I(1)	99.7029	0.000	I(0)
	ADF Fisher						
Ineq	Levin, Lin, Chu t	-3.2698	0.000	I(1)	-10.682	0.000	I(0)
		-1.9183	0.027	I(1)	-9.9389	0.000	I(0)
	Im, Pesaran, Shin t	46.0156	0.007	I(1)	158.700	0.000	I(0)
	ADF Fisher						
RoL	Levin, Lin, Chu t	-0.6967	0.230	I(1)	-4.2003	0.000	I(0)
		0.0776	0.531	I(1)	-6.3077	0.000	I(0)
	Im, Pesaran, Shin t	39.3342	0.243	I(1)	105.757	0.000	I(0)
	ADF Fisher						

gwth	Levin, Lin, Chu	-8.7041	0.000	I(1)	-15.224	0.000	I(0)
	t	-7.3313	0.000	I(1)	-14.214	0.000	I(0)
	Im, Pesaran, Shin t	114.732	0.000	I(1)	227.695	0.000	I(0)
	ADF Fisher						
Mgr	Levin, Lin, Chu	0.50665	0.693	I(1)	-7.7882	0.000	I(0)
	t	7.00636	1.000	I(1)	-7.6610	0.000	I(0)
	Im, Pesaran, Shin t	17.9916	0.988	I(1)	125.590	0.000	I(0)
	ADF Fisher						
Une	Levin, Lin, Chu	-3.5992	0.000	I(1)	-5.9341	0.000	I(0)
	t	-4.1571	0.000	I(1)	-6.3075	0.000	I(0)
	Im, Pesaran, Shin t	75.5765	0.000	I(1)	101.766	0.000	I(0)
	ADF Fisher						
educ	Levin, Lin, Chu	-7.7037	0.000	I(1)	-2.4240	0.007	I(0)
	t	-3.5466	0.000	I(1)	-1.2225	0.110	I(0)
	Im, Pesaran, Shin t	72.2462	0.000	I(1)	50.6380	0.033	I(0)
	ADF Fisher						
*Ineq*RoL*	Levin, Lin, Chu	-3.5874	0.000	I(1)	-15.177	0.000	I(0)
	t	-2.9813	0.001	I(1)	-13.190	0.000	I(0)
	Im, Pesaran, Shin t	60.2822	0.003	I(1)	204.485	0.000	I(0)
	ADF Fisher						

The results of panel cointegration are presented in Table 2; using three different models as in Table 5, we found that the variables are cointegrated. Thisis indicated by the number of statistics that are significant (five out of seven in model 1 and 2 and four in model 3) which supersede some non-significant ones. This implies that long-run relationship exists between the dependent variable (property crime) and the independent variables (inequality, the rule of law, education level, unemployment, immigrants and real GDP per capita growth). Therefore, the null hypothesis of no cointegration amongst variables of interest is at this moment rejected, and the need to further test for the long-run coefficient is recommended.

Table 2 Results of Panel Cointegration

	Model 1		**Model 2**		**Model 3**	
Statistics	Panel Stat.	Group Stat	Panel Stat	Group Stat	Panel Stat	Group Stat
Variance	4.8432***	------	7.5505***	------	-2.0242	------
Rho-stat.	4.1528	5.6059	5.0385	6.2580	3.84042	5.2115
PP-Stat.	-4.5158***	-4.9128***	-7.028***	-7.117***	-1.5455*	-4.4613***

ADF-Stat.	-1.6987**	-1.8142**	-3.064***	-4.983***	-2.1314**	-3.0040***

Estimation based on Pedroni Residual Cointegration, N = 17 and T = 22

Before we estimate the long run, diagnostic checks have been conducted to validate our data set. The tests are conducted to check for the multicollinearity and autocorrelation problems among the variables. Multicollinearity occurred when some of the exogenous variables in a multiple regression model became thoroughly correlated to one another. Multicollinearity problem is detected through the variance inflation factor (VIF). Table 3 reported the results of the multicollinearity based on the columns of the model reported in Table 5, which revealed the absence of multicollinearity problem in the explanatory variables. This is indicated by having the value of VIF less than 10.

Table 3 Results of multicollinearity

	Model 1		**Model 2**		**Model 3**	
Variables	**VIF**	**1/VIF**	**VIF**	**1/VIF**	**VIF**	**1/VIF**
Ineq	1.31	0.7619	1.89	0.5284	4.80	0.2082
Rol			2.93	0.3414		
gwth	1.08	0.9249	1.22	0.8214	1.24	0.8034
Mgr	1.19	0.8430	1.15	0.8662	1.16	0.8654
Unem	1.30	0.7699	1.90	0.5255	1.91	0.5246
educ	1.01	0.9864	1.01	0.9864	1.02	0.9850
Ineq*RoL					3.87	0.2583
Mean VIF	**1.18**		**1.68**		**2.33**	

The autocorrelation result revealed a first-order serial correlation problem. However, this problem has been ratified,and the outcome revealed the nonexistence of autocorrelation problem. Thisis indicated by the probability valueof more than 0.05 (5%) for all the variables of interest. Table 4 below contains the autocorrelation results based on the models in columns 1 – 3 of Table 5. Models 1, 2, 3 in Table 4, correspond to columns 1, 2, 3 in Table 5 respectively.

Table 4 Results of Autocorrelations

	Model 1			**Model 2**			**Model 3**		
Variable	**Coef.**	**RSE**	**P-value**	**Coef.**	**RSE**	**P-value**	**Coef.**	**RSE**	**P-value**
Ineq	0.2073	1.855	0.912	1.7389	2.360	0.461	-2.488	6.752	0.717
RoL				0.2098	0.454	0.650			
gwth	-0.003	0.012	0.760	0.0013	0.013	0.923	0.0031	0.013	0.819
Mgr	-0.003	0.012	0.799	-0.002	0.012	0.821	-0.003	0.012	0.803
Unem	-0.082	0.034	0.028	-0.078	0.031	0.023	-0.076	0.031	0.028
educ	-0.872	0.623	0.181	-0.815	0.629	0.213	-0.807	0.630	0.219
Ineq*RoL							1.2519	2.307	0.595

Note: Coef. = Coefficients, RSE = robust standard errors.

Table 5 presented the results of the long run effects of the independent variables on property crime for a panel of 17 countries in Northern and Western Europe. The estimation was made in three different models represented by columns 1 – 3 in Table 5 as follows.

In column 1 of Table 5, the model is regressed without the rule of law index. The column reported that income inequality is positively and significantly impacts the rate of property crime. A 1 percent increase in income inequality causes a 1.229 percent increase in the number of property crime victims, and the impact is significant at 1% level. This relationship is in line with the theory (see Agnew, 1992) and earlier findings that income inequality enhances criminal activities. Similarly, the relationship indirectly validates the findings of Vauclair and Bratanova (2016) which found income inequality associated with fear of crime. Level of education attainment, on the other hand, reported a negative coefficient which means that a higher level of education among people lowers the level of the crime rate. The report revealed in column 1 that a 1 percent increase in education attainment will explosively trigger a 3.68 percent decrease in the rate of property crime and the impact is significant at 1% level of significance. This strong impact exhibits by the level of education might be as a result of high level of average years of education attainment in the regions.

Table 5 Results of the long run PMG estimations

Long run coefficient	Column 1	Column 2	Column 3
Ineq	1.229***	0.364	1.535***
	(0.373)	(0.277)	(0.296)
RoL	-----	-2.415***	-----
	-----	(0.414)	-----
educ	-3.68***	0.971	0.929
	(0.672)	(0.732)	(0.724)
Unem	-0.486***	0.180**	0.203***
	(0.114)	(0.076)	(0.068)
Imgr	0.090***	0.143***	0.150***
	(0.032)	(0.044)	(0.045)
gwth	0.034***	0.021*	0.018*
	(0.009)	(0.011)	(0.011)
Ineq*RoL	-----	-----	-0.757***
	-----	-----	(0.127)
ECT	-0.168**	-0.143***	-0.151***
	(0.072)	(0.056)	(0.057)
Hausman Value	0.975	0.998	0.999
Observations	309	309	309
Countries	17	17	17

Note: ECT= Error correction term, ***, ** and * are 1%, 5% and 10% significant levels respectively; standard errors in (), Lag selection: ARDL (1,1,1,1,1,1,1,1), selected based on AIC. Dependent variable is property crime.

Immigrants that represent the proportion of foreigners to total population have revealed a positive coefficient, showing that it positively associated with the property crime rate in 17 countries of the Northern and Western Europe; as the percentage of foreigners increased, the rate of property crime also increases and the relationship is significant at 1 percent level. In a similar finding uncovered by Ishak and Bani (2017) showed that population density in four developed states of Malaysia triggers property

crime rate. In column 2, the rule of law is included,anditseffects on property crime showed a negative one. It means that a higher quality of the rule of law index is negatively associated with the rate of property crime; a 1 percent increase in the quality of the rule of law decreases the rate of property crime, by 2.415 percent and the association is significant also at 1% level. This relationship validates the expectation of this study as it corroborates theories and earlier findings on the relationship between institutional quality and crime rate. The model in column 3 has an interactive term of income inequality and the rule of law. This is to further examine the effect of income inequality on property crime in the presence of good quality of the rule of law. The column reported that the interactive term negatively and significantly affects the rate of property crime in the Nordic and Western European countries. This means that in the presence of good quality of the rule of law, income inequality impacts less on property crime.

One noble and important advantage of the above results is that the findings revealed that despite the negative impact of income inequality and unemployment on the level of crime in the Nordic and Western Europe, increasing the level and quality of the rule of law in the regions will help alleviate the crime rate, especially, property crime rate. In addition, the recent migration in to Europe confirms the findings of this study that the proportion of foreigners in Europe contributed to the high rate of crime in Europe.

5.0 Conclusion

The primary objective of this paper was to study the relationship between income inequality and property crime rate in 17 countries of Nordic and Western Europe using the pooled mean group (PMG) estimator. The study also employs the rule of lawindex as a measure of governance, to also examine its relationship with property crime. An interactive term of income inequality and the rule of law was also included in the analysis. Variables such as level of education, unemployment, immigrants and growth were also employed in the regression analysis. Our findings provide evidence for the presence of significant long-run relationship, between property crime and most of the independent variables used by this study. Firstly, the finding on the relationship between income inequality and property crime is in line with the general strain theory by Agnew, (1992) that disparity in income distribution encourages crime rate. The second evident provided by this study is that rule of law is negatively and significantly related to the property crime rate, which conformed to the expectation of our study and the theory by Grasmick et al. (1993). The interaction term also revealed a negative and significant impact on property crime which means that in the presence of the strong rule of law, the effect of income inequality on the property is negative. The proportion of foreigners to the total population, on the other hand, causes property crime. Unemployment and level of education attainment, positively and negatively affect property crime, respectively.

These findings do not permit us to make an extensive statement on other regions of the world as the data, and the sample size is constricted to 17 countries in Northern and Western Europe. Therefore, further studies on other regions are at this moment recommended. Moreover, this study does not also, let us pull certain conclusion about cause and effect; we reasonably assume that income inequality and the rule of laware not mainly triggered by property crime. Besides, the need to take measures on the recent increase in income inequality and effort to reduce its effects is highly recommended. Strengthening the quality of rule law is of helpful, checking illegal movements of people into these regions, provision of job opportunities is at this moment recommended by this study. This will serve as a way of reducing the rate of property crime in these countries.

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