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Debunking conventional wisdom: Higher tertiary education levels could lead to more property crimes in Malaysia

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Abstract: This study examines the relationship between tertiary education and property crime in Malaysia from 1982 to 2020 using the ARDL approach. The study is motivated by the concern that underpaid individuals with higher education may resort to property crime. Results reveal that the female labour force is positively associated with burglary in the short run. Furthermore, income per capita is also found to be another contributing factor to property crime. Increased income levels and improvements in welfare schemes can contribute to reduced crime rates. Interestingly, the study finds that more individuals with tertiary education are associated with higher property crime rates. Property crime can flourish when the skills and qualifications of highly educated job seekers do not match labour needs or

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when suitable employment opportunities are scarce. Enhancing job quality, ensuring fair wages, appropriate job matching, and promoting a well-balanced employment environment may discourage highly educated individuals from turning to crime. Moreover, imprisonment does not act as a deterrent for property crime. The findings may be relevant for curbing property crime in other developing countries experiencing a rise in tertiary education, sluggish income growth, and low female labour participation.

Subjects: Economics; Education Studies; Secondary Education; Sociology of Education; Criminology - Law

Keywords: tertiary education; property crime; inflation; job creation; employment; crime

1. Introduction

Crime involves the violation of national laws, encompassing offences against individuals, property, and public order. These crimes can range from traditional forms, such as theft, robbery, burglary, and assault, to more sophisticated and organised offences like drug trafficking, human trafficking, cybercrime, terrorism, and money laundering. Researchers have extensively studied the underlying causes and motivators of crime, drawing from various fields such as medicine and psychology (Phelan & Link, 2015), social sciences (Bellitto & Coccia, 2018), economics (Barkan & Rocque, 2018), and others. Criminal actions are not exclusive to countries experiencing poverty, weak rule of law, or inadequate welfare provisions. Countries experiencing advancements in welfare also witness increased crime rates (Sugiharti et al., 2023).

Table 1. Top 10 Asia's crime index in 2014 and 2023							
2023				**2014**		**Change 2014 to 2023**	
Rank	**Country**	**Crime Index**	**Safety Index**	**Crime Index**	**Safety Index**	**Crime Index**	**Safety Index**
3	Bangladesh	62,5	37,5	59,4	40,6	−3,1	3,1
6	Mongolia	53,5	46,5	46,9	53,1	−6,6	6,6
7	Cambodia	53	47	32,8	67,2	−20,2	20,2
8	Malaysia	51,6	48,4	67,7	32,3	16,1	−16,1
15	Indonesia	45,9	54,1	40,5	59,5	−5,4	5,4
16	India	44,4	55,6	42,1	57,9	−2,3	2,3
17	Vietnam	44,1	55,9	53	47	8,9	−8,9
18	Pakistan	42,8	57,2	61,5	38,5	18,7	−18,7
19	Philippines	42,6	57,4	54,9	45,1	12,3	−12,3
20	Sri Lanka	42,2	57,8	39,7	60,3	−2,5	2,5
24	Thailand	38,3	61,7	40,5	59,5	2,2	−2,2
31	Brunei	29,2	70,8	30,1	69,9	0,9	−0,9
33	China	25,8	74,2	26,9	73,1	1,1	−1,1
34	South Korea	25,3	74,7	17,4	82,6	−7,9	7,9
37	Singapore	23,1	76,9	20	80	−3,1	3,1
38	Japan	22,9	77,1	13,1	86,9	−9,8	9,8

Notes: The crime index represents the overall level of crime, considering the frequency and various types of offences. A higher crime index indicates a greater prevalence of crime within a country. A low safety index suggests that a country experiences low levels of safety.
Source: Numbeo (2020).

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Table 2. Crime index by type of crime, Malaysia, 2019 and 2020								
Type of Crimes	**1977**	**1985**	**1995**	**2005**	**2009**	**2015**	**2019**	**2020**
Violence	6064	11422	10585	22039	40738	21809	16489	13279
-Murder						498	310	253
-Rape						2047	1738	1582
-Robbery						13749	9729	7326
-Causing Injury						5515	4712	4118
Property	59173	77743	70598	135326	168679	93665	66967	52344
-House break-in & Theft						19286	16497	14040
-Vehicles theft						54011	30867	21579
-Snatch theft						2361	19	
-Other theft						18007	19582	16725
Total	65237	89165	81183	157365	209417	115474	83456	65623

Source: Department of Statistics Malaysia.

Figure 1. Violence and property crime in Malaysia from 1977–2021.

Source: Royal Malaysian Police (PDRM).
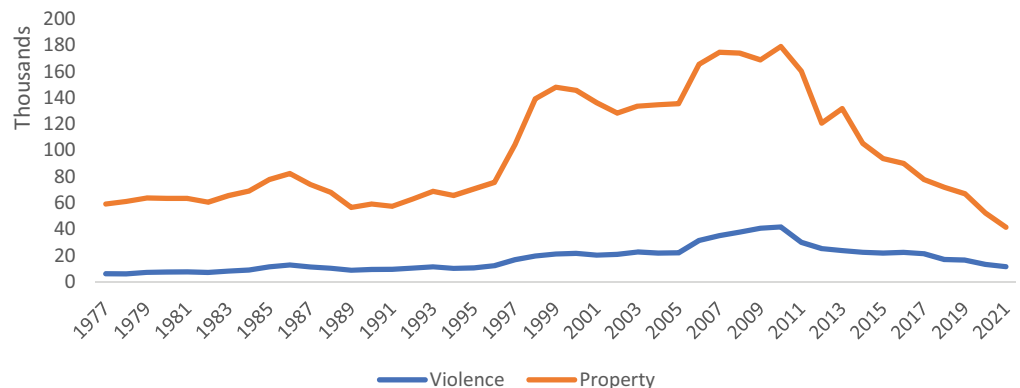
Notably, a country like Malaysia, which has made significant strides in education, economic development, and institutional maturity, also faces elevated crime levels. Malaysia, with a higher level of income per capita, a more stable economy, and a higher human development index compared to its developing Asian counterparts, also exhibited a higher crime index. As of 2023, Malaysia reported a lower safety index, indicating a less secure environment and a higher crime index compared to Asian peers such as China, Brunei, Thailand, the Philippines, Vietnam, India, and Indonesia (Table 1). Furthermore, Malaysia's crime index and safety index experienced deterioration from 2014 to 2023. When compared to its Asian peers, Malaysia exhibits a relatively higher prevalence of criminal activities compared to other regional partners.

Malaysia is a developing country committed to achieving the United Nations' 17 Sustainable Development Goals (SDGs) by 2030. One key aspect of this effort is improving the country's safety and security. Despite the government's success in curbing some types of crime, important criminal activity has persisted in Malaysia over the past few decades (Peletz, 2023; Zulkiflee et al., 2022). In 1990, 68488 crime cases were reported in Malaysia, increasing to 99,168 cases in 2017 (Figure 1). This trend has created significant public safety challenges (Ishak & Bani, 2017). According to the

Department of Statistics Malaysia (2018), 2009 saw the highest crime rate, with violent crime increasing by 12.02% (42,365 cases in 2009), while property crime decreased. Still, according to the Royal Malaysian Police (PDRM), the country experienced a decline in 2020 compared to 2010 in the overall crime rate, encompassing both violent and property offences (Table 2). Violent and property crimes experienced declines of 39% and 45%, respectively. Regarding violent crimes, including murder, rape, robbery, and assault, there was a notable drop in murder and robberies of more than 40%. Property crimes involving thefts from residences, motor vehicles, purses, and other personal belongings also exhibited noteworthy declines. Nevertheless, in the previous decades, from 1977 to 2009, property crimes skyrocketed from less than 60,000 cases in 1977 to nearly 170,000 cases in 2009.

The escalating trend of burglary threatens public safety and hinders economic growth and progress in attaining the SDGs (Hope Sr, 2020; Tan, 2019). Previous studies have identified various factors influencing crime, such as unemployment, income, inflation, deterrence, and social elements (X. Chen & Zhong, 2021; Engelen et al., 2015; Ishak & Bani, 2017; Lau et al., 2019). Nevertheless, there remains significant uncertainty regarding the impact of these factors on crime rates, particularly for disaggregated crime (Brosnan, 2018). Moreover, the majority of studies have concentrated on total crime rather than examining individual types of crime separately (Khan et al., 2015; Sugiharti et al., 2023), making it difficult to develop targeted strategies to combat specific types of crime, such as property or violent crime. Considering the detrimental effects of crime on the overall quality of life and its wider repercussions on society and the economy (Enamorado et al., 2016), pursuing ongoing research to identify the primary drivers of crime in Malaysia remains imperative.

Previous research has shown limited focus on investigating the influence of social determinants, such as tertiary education and female employment, on crime rates. However, it is essential not to disregard the potential significance of both factors as determinants. Particularly, education is believed to play a pivotal role in crime reduction by equipping individuals with high-paying employment opportunities, thereby reducing the likelihood of involvement in criminal activities (Khan et al., 2015; Nguyen, 2019; Wassie, 2020).

Despite recognising the potential significance of education as a crime determinant, exploring tertiary education's effects on crime rates remains relatively scarce in the existing literature. Previous studies have predominantly focused on primary and secondary education (e.g., Ishak & Bani, 2017; McAdams, 2015), leading to a gap in our comprehension of how higher education may influence crime rates, particularly within the context of developing countries like Malaysia.

The impact of education on crime is diverse. First, higher education serves as a proxy for increasing welfare, indicating greater opportunities to benefit from legal activities and reducing the incentives for engaging in criminal behaviour (Lochner, 2020; Rakshit & Neog, 2020). Under the framework of Becker (1968), education contributes to human capital and supports higher earnings. Higher incomes raise the cost associated with illicit activities and thus decrease the prospect of crime (Choe, 2008). Second, education increases employment prospects and could reduce the probability of engaging in crime, which might cause the lawbreaking rate to plunge (Bell et al., 2016). Still, the deterioration of the labour market and lack of employment opportunities might increase crime (Meloni, 2014). Third, higher education attainment raises the opportunity cost of imprisonment (Wu & Wu, 2012), with more educated individuals facing larger losses while in prison (Sugiharti et al., 2022). Fourth, higher education can alter the preferences of individuals towards the decision to engage in crime (Mauladi et al., 2022).

While many studies have suggested that higher education is associated with lower crime rates (Hjalmarsson & Lochner, 2012; Lochner, 2020; Lochner & Moretti, 2004; Wang et al., 2022), recent evidence from Malaysia raises doubts about this relationship (Ishak & Bani, 2017; Zulkiflee et al., 2022). Specifically, the increasing number of graduates in the country has led to a significant

increase in graduate unemployment (Jamaludin et al., 2021; Said et al., 2021), which raises questions about whether individuals with tertiary education are less likely to commit crimes.

According to data from the Department of Statistics Malaysia (2021), the number of unemployed individuals with tertiary education increased by 30.1% in 2020. Moreover, in 2019, there were 4,616,400 people with tertiary education in the labour force, but only 4,435,200 were employed, including those underemployed. Additionally, recent data from the Ministry of Higher Education (MoHE) indicates that around 10% of fresh graduates earn low salaries (RM1,000 – RM1,500) for at least ten years (Lim & Ayamany, 2021), which may make it difficult for them to meet their basic needs. In countries like Iran, low wages in tertiary education have been associated with increased crime

Similar evidence appears in the case of Brazil (Britto et al., 2022), Croatia (Recher, 2020), France, and the U.K (Jawadi et al., 2021), where unemployment and crime show a significant association. These trends suggest that our assumption that individuals with tertiary education are less likely to commit crimes may not hold true in Malaysia. Some graduates may be compelled to engage in criminal activity due to their low salaries, which are not commensurate with their qualifications (Khoo et al., 2022). In some cases, they may even earn less than those without higher education or lack job opportunities (Jamaludin et al., 2021).

The association between higher burglary rates and individuals with tertiary education can be influenced by several underlying reasons, which may challenge the assumption that higher education always correlates with reduced criminal behaviour. First, not all individuals with tertiary education can secure well-paying jobs that align with their qualifications (Khoo et al., 2022), leading to persistent economic disparities and income inequality even among educated cohorts. Second, when a significant proportion of graduates face low salaries or encounter limited job prospects, financial strain may ensue, elevating the likelihood of engaging in property crime to meet basic needs or sustain a desired standard of living (Jamaludin et al., 2021). Third, a mismatch may exist between the skills acquired during tertiary education and the demands of the job market, resulting in graduates finding themselves in positions that underutilise their qualifications or lack adequate financial compensation (Haddad & Markazi, 2011). Such discontent and disillusionment can contribute to frustration and potentially foster involvement in criminal activities. Fourth, despite possessing higher education, some individuals may experience unemployment or confront job insecurity due to fluctuations in the job market or economic conditions (Britto et al., 2022). The lack of stable employment opportunities may induce feelings of desperation, pushing some towards committing property crimes as a means of survival.

Given these challenges, it is important to re-examine the relationship between tertiary education and crime rates in Malaysia. Contrary to conventional expectations, which propose that longer years of education would reduce crime rates due to increased time devoted to education and the reinforcement of discipline in students (Buonanno & Leonida, 2009; Campaniello et al., 2016; Machin et al., 2011; Nguyen, 2019; Rakshit & Neog, 2020), we hypothesise a positive association between an increase in the number of people with tertiary education and property crime rates in Malaysia. The increasing number of graduates and high rates of graduate unemployment potentially contribute to this unexpected relationship, highlighting the necessity of adopting a socioeconomic approach to explore further the economic factors associated with crime in Malaysia.

To examine the nexus between education and burglary in Malaysia, we apply an ARDL model using data from 1982 to 2017. The ARDL allows differentiating the short-run and long-run effects. To gain a deeper understanding of the intricate relationship between education, economic aspects, employment, and crime in the country, we incorporate the roles of unemployed individuals, consumer prices (as a proxy for the cost of living), prison population growth (as a proxy for

deterrence), employed people with tertiary education, income (as a proxy for fair wages), and the female labour force.

While other studies in Malaysia have offered valuable insights into crime in general (Zulkiflee et al., 2022), violent crime (Shaari et al., 2022), urban crime (Ghani, 2017), and other types of violations (Baharom & Habibullah, 2009; Ozden et al., 2018), our study focuses on property crime and its nexus with higher education, an aspect of crime that has not been extensively explored in the Malaysian context. Furthermore, we include the deterrence through incarceration variable to assess whether increasing incarceration rates discourage burglary. Previous studies have highlighted the significance of deterrence, particularly for property crime (X. Chen & Zhong, 2021; Levitt, 1998), as an increase in arrests related to other types of crimes may prompt individuals to shift towards other types of crime (Flórez, 2021), i.e., burglary.

Understanding the underlying causes of crime and developing evidence-based strategies to address these issues are essential components of this endeavour (Barkan & Rocque, 2018). By uncovering new evidence concerning the nexus between crime and various socio-economic factors, we can gain valuable insights into the necessity of bolstering law enforcement capacity and allocating additional resources. These measures are crucial for enhancing the effectiveness of law enforcement in preventing and responding to criminal activities (Sugiharti et al., 2022).

2. Theoretical backgrounds and literature review

Criminal motivation is a complex concept influenced by various factors, including biological, psychological aspects (Baglivio et al., 2020; Phelan & Link, 2015), social factors (Barkan & Rocque, 2018; Lochner, 2020; Peletz, 2023; Wassie, 2020; Wu & Wu, 2012), and medical sociology (Barkan & Rocque, 2018). While some experts attribute a person's inclination towards criminal behaviour to their genes or childhood experiences (Baglivio et al., 2020), others argue that environmental factors play a more significant role (Kim et al., 2020; Nguyen, 2019). Furthermore, Hirschi emphasised that criminal behaviour is influenced by a person's inclination to engage in unlawful activities and the presence of opportunities to do so.

The concept of criminal motivation and opportunity states that for someone to engage in criminal activity, they must have both a motive and the chance to act on it (Braithwaite, 1981). Criminal chance refers to situations that facilitate the commission of a crime, such as easy access to potential targets, inadequate security measures, or the absence of law enforcement (Uchenna & Adrian, 2018). The likelihood of criminal behaviour decreases when opportunities to commit a crime are reduced. Conversely, if ample opportunities exist for someone to commit a crime but are not motivated to do so, engaging in criminal behaviour becomes unlikely (Bellitto & Coccia, 2018). Cantor and Land (1985), Cohen and Felson (1979), and more recently, Krulichová (2021) noted that factors like criminal motivation and chance could lead to criminal behaviour.

Many studies have looked at the different determinants that can lead to crime, finding that social factors, deterrents, unemployment, income (GDP per capita), inflation, and income are key factors that affect crime (Engelen et al., 2015; Ishak & Bani, 2017; Khan et al., 2015; Lau et al., 2019; Rennó Santos et al., 2021).

Becker (1968) and Ehrlich (1973) analysed crime from an economic perspective, highlighting that unemployment is a significant cause of criminal behaviour. The likelihood of people earning money through legitimate means decreases as the jobless rate increases. A potential link between unemployment and crime emerges, as individuals may resort to illegal activities when the jobless rate is high (Britto et al., 2022; Khoo et al., 2022; Recher, 2020). Even though unemployment is a major cause of crime in both developed (Costantini et al., 2018; Jawadi et al., 2021; Wu & Wu, 2012) and emerging countries (Britto et al., 2022; de Hoyos et al., 2016), its effect on different types of crime is different (Baharom & Habibullah, 2008; Sugiharti et al., 2022). For example, unemployment affects violent crime more than property crime (de Hoyos et al., 2016; Sugiharti

et al., 2022). Studies done in Malaysia (Ishak & Bani, 2017; Tang & Darit, 2015) have regularly found a link between unemployment and crime. Groot and van den Brink (2010) discovered that gender significantly influences criminal behaviour. Men commit more violent crimes than women (Peletz, 2023) and are more likely to be involved in serious crimes (Jonck et al., 2015).

Furqan and Mahmood (2020) investigated the link between education and violent crime in Asia from 2000 to 2015, utilising various panel data approaches. They discovered that higher education correlates with a lower likelihood of violent crime. Conversely, Anwar et al. (2017) examined time series data for Pakistan from 1973 to 2010 and found that education has a long-term positive effect on total, property, and violent crime. Haddad and Moghadam (2011) held a different perspective, arguing that education might account for both murders and threats in Iran, as individuals with low skill levels are more likely to engage in criminal activity due to low returns on their work. However, they did not employ statistical models to examine the relationship between education and crime rates. Meanwhile, Ishak and Bani (2017), using enrollment rates in secondary schools as a proxy for educational level, found no significant association between education and total or violent crime rates in four states in Peninsular Malaysia.

This current study aims to evaluate alternative proxies for education, such as the number of workers with tertiary education, to measure the impact of education on crime rates. The general view is that higher education can equip individuals with better decision-making skills, discouraging them from committing crimes by providing better returns in the legal labour market (Bell et al., 2016). The common assumption that individuals with tertiary education are less likely to engage in criminal behaviour may not be universally valid. This is because some individuals may be motivated to commit crimes due to low wages that do not align with their qualifications (Baharom & Habibullah, 2008; Khoo et al., 2022; Said et al., 2021). Furthermore, it is worth noting that certain individuals with degrees may earn lower salaries than those who lack such qualifications (Said et al., 2021). Besides, more individuals with higher education degrees may lead to a rise in envious behaviour by those not having access to higher education. Property crime may have a lower cost (risk) associated with illegal action than other violations involving more brutality and may have lower returns (Badiora et al., 2017). Punishments for burglary tend to be lower than other illegal actions (i.e., murder, physical violence, armed robbery, and others). Therefore, it is crucial to revisit the relationship between tertiary education and crime rates since no compelling evidence in Malaysia fully explains the impact of tertiary education on crime.

A thorough understanding of criminal motivations and available opportunities is essential for developing effective crime prevention strategies, enhancing law enforcement, and ensuring public safety (Krulichová, 2021). Undoubtedly, there is a need for new approaches to gain a deeper understanding of criminal behaviour and its contributing factors. Recent studies have put forth innovative methodologies to unveil the underlying factors behind criminality. Among others, geospatial crime analysis has emerged as a promising new research avenue (Boppuru & Ramesha, 2020). Prathap and Ramesha (2020) explored criminal behaviour on social media using news feed data, employing textual data analytics and the Naive Bayes classification system to categorise crime based on geography and time. They also utilised the Kernel Density Estimation (KDE) algorithm to identify high-crime rate areas. Prathap (2023) used KDE in a GIS to examine crime data from Bangalore and Indian news sources, focusing on a KDE machine learning algorithm for spot detection, crime rate estimation, and low and high-point pattern detection. Their study proposed an improved KDE technique considering the GIS bandwidth's effect on crime rate depiction, revealing highly predictive news feed data compared to official government sources (with 77.49% accuracy). Using news feeds, Facebook, and Twitter data, Boppuru and Ramesha (2019) forecasted 16 types of criminal activities in India and Bangalore. They incorporated GPS coordinates and textual data analytics in 2020 and employed KDE to identify areas with high crime concentration, further categorising 68 lexicon phrases related to criminal activity. The study utilised the ARIMA model for time series prediction and a scalable data mining platform to illustrate diverse crime patterns.

Our work's novelty lies in its hypotheses, which challenge prevailing beliefs in the existing literature regarding the relationship between higher education attainment and crime rates. We argue that in the Malaysian context, where a growing number of graduates and high rates of graduate unemployment coexist, there is a potential rise in burglary. Despite Malaysia's improvement in welfare over the last decades (Ishak & Bani, 2017), marked by increased female workforce participation (Akhtar et al., 2023), relatively low unemployment (Sarhan & Ab Aziz, 2023), and the presence of social welfare programs (Abdullah et al., 2023), there appears to be a potential link between an educated labour force and property crime. Factors such as labour mismatch (Said et al., 2021), underpaid jobs (Khoo et al., 2022), rising living costs (Shaari et al., 2022), financial strain, unmet expectations, and female unemployment (Recher, 2020) could contribute to educated workers resorting to criminal activities.

3. Methodology

The primary objective of this study is to elucidate the occurrence of burglary in Malaysia by investigating the relationships between property crime and a set of socioeconomic variables. The dependent variable for this study is the property crime index (PCR). Unemployment is proxied by the total number of unemployed individuals (U), while inflation is represented by the consumer price index (CPI). Deterrence is represented by prison population growth (PRIS), and the number of employed people with tertiary education (EDU) serves as a measure for tertiary education. GDP per capita is considered a proxy for income (Y), whereas the number of women in the labour force is considered a proxy for the female labour force (F.L.). This study collected data from multiple sources, including the Department of Statistics in Malaysia.

The study applies a unit root test to determine whether a time series variable is non-stationary and has a trend or a random walk. The Augmented Dickey-Fuller (ADF) test is the most widely used unit root test. It calculates a regression model using the time series variable and its lagged values to ascertain whether the variable has a unit root. The test's null hypothesis is that the variable has a unit root. If the p-value is lower than the significance level, the null hypothesis is rejected, implying that the variable is stationary. The unit root test is crucial in time series data analysis as it helps select the best modelling strategies and prevents erroneous regression. All variables are transformed into natural logarithms to enable interpretation in percentage terms. The model specification is as follows:

$$LNPCR_t = a_0 + a_1 LNU_t + a_2 LNCPI_t + a_3 LNPRIS_t + a_4 LNEDU_t + a_5 LNY_t + a_6 LNFL_t + \mu_t \tag{1}$$

The variable LNPCR represents the natural logarithm of the total number of property crimes per 100,000 people, while t denotes the time period from 1982 to 2020. The independent variables include the natural logarithm of the total number of unemployed individuals (LNU), the natural logarithm of the consumer price index (LNCPI), the natural logarithm of prison population growth (LNPRIS), and the natural logarithm of the total number of employed people with tertiary education (LNEDU). The income (Y) and female labour force (LNFL) are the logarithms of the number of women in the labour force and GDP per capita, respectively. The symbol μ denotes the error term or white noise.

The ARDL bounds testing method is a widely used econometric technique for analysing the long- and short-term dynamics of the relationship between two or more variables in a time series environment. This method is used to determine whether the variables are co-integrated. The ARDL model estimates the dependent variable's relationship with its lags and the independent variables' relationships with their lags. The approach used in this study is more flexible than other methods in estimating cointegration between non-stationary variables, especially when the variables have different orders of integration, such as the Johansen cointegration test. The ARDL technique is commonly used in macroeconomic research, finance, and other fields with time series

data. The main advantage of the ARDL bound test over the Johansen cointegration approach is that it is more efficient with small or finite sample data sizes (Pesaran et al., 2001).

Additionally, the technique provides simultaneous long-run and short-run estimations and considers the dynamic interactions between the variables, which can help address the endogeneity problem. The F-statistic determines the presence or absence of a long-run correlation. A long-run correlation is present if the F-statistic exceeds the critical value for the upper bound. Conversely, no long-run correlation exists if the F-statistic is lower than the lower bound. The findings are inconclusive if the F-statistic falls between the upper and lower critical boundaries (Pesaran et al., 2001).

In summary, the ARDL bounds testing method is useful for analysing the relationship's long- and short-term dynamics between non-stationary variables. This technique allows for flexible cointegration estimation and simultaneous long-run and short-run estimations while accounting for dynamic interactions between the variables. Moreover, it is more efficient with small or finite sample data sizes than other approaches like the Johansen cointegration test. The ARDL approach is commonly used in various fields with time series data. Therefore, Equation 1 can be written as follows:

$$
\begin{aligned}
\text{LNPCR}_t = {} & \beta_0 + \beta_1 \text{LNPCR}_{t-1} + \beta_2 \text{LNU}_{t-1} + \beta_3 \text{LNCPI}_{t-1} + \beta_4 \text{LNEDU}_{t-1} + \beta_5 \text{LNPRIS}_{t-1} \\
& + \beta_6 \text{LNY}_{t-1} + \beta_7 \text{LNFL}_{t-1} + \sum_i^p \kappa_1 \Delta \text{LNPCR}_{t-i} + \sum_j^q \kappa_2 \Delta \text{LNU}_{t-j} + \sum_k^r \kappa_3 \Delta \text{LNCPI}_{t-k} \\
& + \sum_l^s \kappa_4 \Delta \text{LNPRIS}_{t-l} + \sum_m^t \kappa_5 \Delta \text{LNEDU}_{t-m} + \sum_m^u \kappa_6 \Delta \text{LNY}_{t-m} + \sum_m^v \kappa_7 \Delta \text{LNFL}_{t-m} + \mu_t
\end{aligned}
\tag{2}
$$

Where p is the ideal lag length, and Δ is the difference operator. $\beta_1 \dots \beta_7$ addresses the long-run relationship, and $\kappa_1 \dots \dots \kappa_7$ addresses the short-run model. Rewriting Equation 2 to the following

Table 3. Descriptive statistics results							
	LNCPI	**LNEDU**	**LNFL**	**LNPC**	**LNPRIS**	**LNU**	**LNY**
Mean	4.3741	14.1679	14.9997	5.7908	1.3402	12.8720	10.0049
Median	4.4026	14.2158	15.0098	6.0921	1.2425	12.8719	10.0292
Maximum	4.8777	15.5978	15.6032	6.4848	1.9387	13.1305	10.6529
Minimum	3.8726	12.7123	14.3942	2.2093	9.5752	12.2779	9.3539
Std. Dev.	.3031	0.8582	0.3643	1.0458	.3701	0.1746	0.3931
Skewness	−.0861	−0.0752	0.0735	−2.8701	.0050	−0.9382	−0.2025
Kurtosis	1.7912	1.8163	1.8515	9.9361	2.0363	4.9316	1.9156
Observations	39	39	39	39	39	39	39

Table 4. Correlation results							
	LNCPI	**LNEDU**	**LNFEM**	**LNGDP**	**LNPRIS**	**LNUMP**	**LNPC**
LNCPI	1.0000						
LNEDU	.2241	1.0000					
LNFEM	.0163	0.0390	1.0000				
LNGDP	.1051	0.2737	0.0198	1.0000			
LNPRIS	.1068	0.2763	0.7146	.1311	1.0000		
LNUMP	−.0497	−0.1336	−0.0039	−.0678	−.0448	1.0000	
LNPC	.7746	0.8497	0.3188	.7341	.6750	−.4850	1.0000

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Table 5. Unit root test results				
	No Trends		**Trends**	
	Level	**1ˢᵗ difference**	**Level**	**1ˢᵗ difference**
LNPC	−0.5768 (0.9872)	−5.5524*** (0.0000)	−0.1069 (0.9929)	−6.0214*** (0.0001)
LNU	−3.7886*** (0.0064)	−5.9540*** (0.0000)	−4.0972** (0.0135)	−5.8895*** (0.0001)
LNY	−0.2950 (0.9163)	− 5.1337*** (0.0002)	−1.8174 (0.6765)	−5.0598*** (0.0011)
LNCPI	−0.0804 (0.9444)	−4.6120*** (0.0007)	−1.5959 (0.7759)	−4.5525*** (0.0044)
LNPRIS	−1.3509 (0.5957)	−6.5952*** (0.0000)	−3.2560 (0.0892)	−6.5293*** (0.0000)
LNEDU	−0.3340 (0.9102)	−5.7338*** (0.0000)	−2.8493 (0.1897)	−5.9106*** (0.0001)
LNFL	−0.2430 (0.9240)	−6.0743*** (0.0000)	−2.6765 (0.2514)	−5.9911*** (0.0001)

Notes: ***, and ** indicate the significance levels of 1%, and 5%, respectively.

equation can be used to predict the short-term coefficients and the adjustment speed for the ARDL equation for the error correction model (ECM):

$$\text{LNPCR}_t = \sigma_0 + \sum_{j}^{q} \kappa_2 \Delta \text{LNU}_{t-j} + \sum_{k}^{r} \kappa_3 \Delta \text{LNCP I}_{t-k} + \sum_{l}^{s} \kappa_4 \Delta \text{LNPRI S}_{t-l} + \sum_{m}^{t} \kappa_5 \Delta \text{LNEDU}_{t-m}$$
$$+ \sum_{m}^{t} \kappa_6 \Delta \text{LN Y}_{t-m} + \sum_{m}^{t} \kappa_7 \Delta \text{LNF L}_{t-m} + \Psi \text{EC T}_{t-1} + \mu_t \qquad (3)$$

The error correction term, denoted as ECTt-1, serves to determine the rate of adjustment in the system. A significantly negative coefficient (Ψ) of the ECT provides evidence of cointegration, indicating long-term relationships among the variables in the model.

4. Findings

The results in Table 3 provide descriptive statistics for seven variables (LNCPI, LNEDU, LNFL, LNCP, LNPRIS, LNU, and LNY) based on 39 observations in the study context. The mean represents the average value of each variable, while the median indicates the middle value in the data set. The maximum and minimum values represent the highest and lowest observations, respectively. The standard deviation measures data spread, skewness assesses data symmetry, and kurtosis indicates data peakedness. These statistics offer valuable insights into the data distribution characteristics for each variable, providing an overview of their central tendency, variability, and shape.

The correlation results presented in Table 4 show the correlation coefficients between seven variables: LNCPI, LNEDU, LNFL, LNCP, LNPRIS, LNU, and LNY. The correlation coefficient indicates the strength and direction of the relationship between two variables. The diagonal elements have

Table 6. Bound test results		
F-Statistic	**3.8209***	
Critical values	**Lower Bound**	**Upper Bound**
10%	2.12	3.23
5%	2.45	3.61
1%	3.15	4.43

Notes: *** indicates the significance level of 1%.

a correlation of 1.0000 since they represent the correlation of each variable with itself. The off-diagonal elements provide the correlation between pairs of variables. There are correlations between LNCPI, LNFEM, LNEDU, LNGDP, LNPRIS, LNUMP, and LNPC. However, some correlations are relatively weak or near zero.

The unit root test is a crucial step in any time series analysis, as it helps to determine whether a variable is stationary or non-stationary. Stationarity is an essential assumption for time series models, including the ARDL approach, which analyses the relationship between dependent and independent variables. The ADF unit root test results in Table 5 indicate that the stationarity of the variables is contingent on the inclusion or exclusion of a time trend and the level of the variable. The test results show that, without a trend, only LNU is stationary in the level, but all the variables are stationary in the first difference. This suggests that including the first difference could remove the non-stationarity of the variables, making them suitable for time series analysis.

On the other hand, when a trend is included, the results show that only LNUN is stationary in the level, while all the variables are stationary in the first difference. This suggests that the presence of a trend in the data may affect the stationarity of the variables, with some variables becoming stationary only after first differencing. Based on these results, using the first differences of the variables in the ARDL approach is recommended, as this would ensure that all the variables are stationary, with or without a trend. However, it is important to note that including a time trend can help capture the long-term relationship between the variables, which may be necessary for certain research questions. In summary, the unit root test results suggest that including the first difference can remove the non-stationarity of the variables, making them suitable for time series analysis. However, the presence of a time trend may affect the stationarity of the variables. Including a time trend could be essential to capture the long-term relationship between the variables.

The results of the bound test in Table 6 show that the F-statistic value of 3.8209 is greater than the upper bound critical value at the 5% significance level (3.61), indicating that we can reject the null hypothesis of no cointegration between the variables. Therefore, there is evidence of

Table 7. Short-run & long-run elasticities			
Short-run Independent Variables	**Coefficient**	**t-statistic**	**Prob.**
LNU	0.7989	1.0101	0.3275
LNY	3.9754	1.8225	0.0871
LNCPI	7.2289	0.9447	0.3588
LNPRIS	0.8104	0.8494	0.4082
LNEDU LNFL	−12.1986*** 10.0735***	−5.8383 3.4004	0.0000 0.0037
Long-run Independent Variables	**Coefficient**	**t-statistic**	**Prob.**
LNU	0.8421	1.7237	0.1040
LNY	−5.2529***	−3.1668	0.0060
LNCPI	2.2341	0.6160	0.5465
LNPRIS	0.2253	0.3151	0.7568
LNEDU	2.4130**	2.2193	0.0413
LNFL	−1.7901	−1.1015	0.2870

Notes: ***, **, and * indicate the significance levels of 1%, 5%, and 10%, respectively.

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| Table 8. Diagnostic tests results		
Statistics	**F-statistic**	**p-value**
Correlation L.M. Test	2.7200	.1396
Heteroskedasticity Test	1.6129	.1692
Jarque-Bera Test	0.2814	.8687
Ramsey RESET Test	0.1614	.6950

cointegration between the variables in the model. Consequently, examining and interpreting the enduring association between the variables is feasible using Vector Error Correction Models (VECMs), which permit the estimation of short-term and long-term impacts of alterations in one or multiple variables on the dependent variable.

The short-run and long-run elasticities in Table 7 show the estimated coefficients and t-statistics for each independent variable in the model and their associated probabilities (or p-values). The long-run elasticities show the estimated long-run effect of a 1% increase in each independent variable on the dependent variable (property crime), holding all other variables constant. The short-run elasticities show the estimated short-run effect of a 1% increase in each independent variable on the dependent variable, holding all other variables constant.

Looking at the short-run elasticities, we can see that the variables with statistically significant coefficients at the 1% level of significance are the number of employed people with tertiary education (LNEDU) and female labour force participation (LNCPI), with coefficients of −12.1986 and 10.0735, respectively. This suggests that a 1% increase in the number of employed people with tertiary education is associated with a short-run decrease in property crime of 12.1986%. Similarly, a 1% increase in female labour force participation is associated with a short-run increase in property crime of 10.0735%. In the short-run elasticities table, the coefficients for prison population growth, income per capita, unemployment and inflation do not achieve statistical significance at the 5% level. Hence, there is no substantial link between these variables and changes in property crime over the short run.

Table 8 shows the results of four different tests used to check for potential issues with the regression model. The correlation L.M. test is used for residual serial correlation, which occurs when the error terms in the regression model are correlated. In this case, the F-statistic value of 2.7200 and the p-value of 0.1396 suggest no significant evidence of residual serial correlation in the model. The heteroskedasticity test is used to test for the unequal variance of the error terms in the regression model. A significant result could indicate that the variance of the error terms is not constant across different values of the independent variables. In this case, the F-statistic value of 1.6129 and the p-value of 0.1692 suggest some evidence of heteroskedasticity in the model. Still, the result is not statistically significant at the 5% significance level. The Jarque-Bera test is used to

Figure 2. CUSUM and CUSUM of squares results.
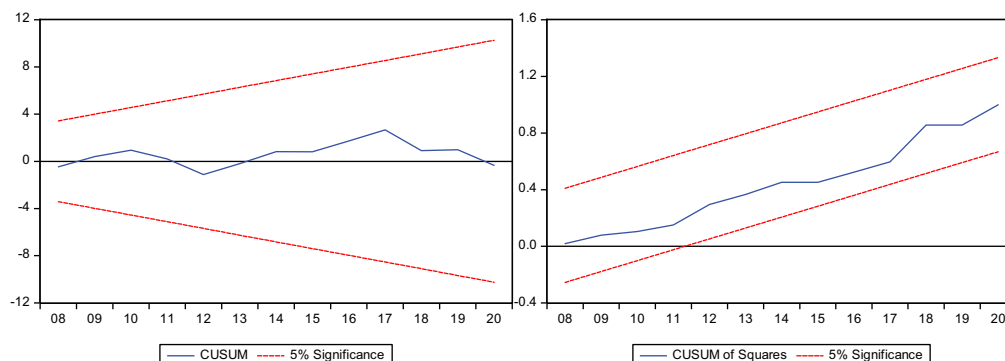
test for the normality of the error terms in the regression model. A significant result could indicate that the error terms are not normally distributed, which could affect the accuracy of the estimated coefficients and lead to biased results. In this case, the F-statistic value of 0.2814 and the p-value of 0.8687 suggest no significant evidence of departure from normality in the error terms.

The Ramsey RESET test is used to test for omitted variable bias, which occurs when important independent variables are not included in the regression model. A significant result could indicate missing variables that are important in explaining the dependent variable. In this case, the F-statistic value of 0.1614 and the p-value of 0.6950 suggest no significant evidence of omitted variable bias in the model. Overall, based on the results of the diagnostic tests, there is no evidence of major issues with the regression model. However, there is some evidence of heteroskedasticity, which could affect the accuracy of the estimated standard errors and lead to biased results. If heteroskedasticity is a concern, one possible solution is to use heteroskedasticity-consistent standard errors in the regression analysis.

The CUSUM (Cumulative Sum) and CUSUM of Squares charts are graphical tools used to detect changes in the parameter estimates of a regression model over time (Figure 2). The chart plots the CUSUM and CUSUM of Squares of the residuals against time, and the blue line represents the cumulative sum of the residuals while the red lines represent the upper and lower control limits. When both the blue lines are inside the red lines, it indicates that the parameter estimates are stable over time and that there is no evidence of a significant change in the relationship between the dependent variable and the independent variables included in the regression model. This is a desirable outcome because it suggests that the model is reliable and that the estimates of the coefficients are not affected by changes in the data over time.

5. Discussions

The findings of this study indicate that a higher number of employed individuals with tertiary education can have varying effects on property crime rates. In the short run, such employment reduces property crime, but it may contribute to an increase over the long run. The finding contrasts with Hjalmarsson and Lochner's (2012) and Lochner's (2020) conclusions and the prevailing belief that higher education reduces property crime. This situation demands swift attention, as many employed individuals with higher education are experiencing underpayment, which can drive them towards property crimes. It is crucial to recognise that having tertiary education and being employed does not inherently guarantee fair wages or access to high-paying jobs. Economic disparities and income inequality persist even among educated individuals in Malaysia, as noted in earlier studies (Jamaludin et al., 2021; Khoo et al., 2022). Consequently, a significant portion of these employed individuals may find themselves underpaid or struggling to meet their financial needs, in line with previous evidence in Malaysia (Jamaludin et al., 2021; Said et al., 2021). As a result, some may resort to property crime as a means to make ends meet or improve their living standards, leading to increased crime rates over time. This frustration and disillusionment with their financial situation might also prompt discontent and, in some cases, motivate individuals to engage in property crime as a form of rebellion or coping mechanism.

On the other hand, higher income per capita can decrease property crime in the long run, particularly in Malaysia. This result is similar to the finding of Ishak and Bani (2017), who also found a connection between GDP per capita and property crime in Malaysia. Increased income levels afford individuals better access to basic needs like food, housing, and healthcare. Abdullah et al. (2023) emphasised that household income positively impacts the upbringing and character development of children in Malaysia. When people's essential requirements are adequately met, they are less likely to resort to property crime as a survival strategy or to fulfil their basic needs. Reduced financial desperation decreases individuals' motivation to steal or commit property crimes out of necessity.

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Regarding the impact of higher female labour force participation on property crime in Malaysia, an increase in women's employment may lead to more opportunities for property crime. This result is different from the study of Y. Y. Chen et al. (2017), who found that female employment can lower crime. Likewise, Mishra et al. (2021) discovered that property crime adversely affects the involvement of women in the workforce in India. By contrast, our findings suggest that as women become more present in public spaces due to their increased workforce participation, certain crimes, such as theft or fraud, could become more accessible. However, it is essential to emphasise that this association is not a direct causation, and numerous other factors, including societal norms and law enforcement measures, play crucial roles in determining crime rates.

In 2020, female labour participation in Malaysia reached nearly 51%, marking an increase from 43% in 2010 (Akhtar et al., 2023). This suggests a growing trend of more women entering the labour force. Our findings indicate that as more women join the labour market, there is a likelihood of witnessing an increase in property crime.

Regarding the efficacy of imprisonment as a deterrent to property crime, our findings indicate a lack of significant correlation, suggesting that imprisonment may not be an effective strategy in discouraging individuals from engaging in property crime, in line with (Chamberlain, 2018). To enhance crime prevention measures, it might be essential to integrate increased awareness of the severity of punishment (Simes, 2019), bolstered law enforcement (Spelman, 2020), and intensified policing activities alongside imprisonment as a strategy to reduce property crime.

In conclusion, understanding the relationship between employment, education, and property crime requires careful consideration of various contributing factors. Economic disparities and income inequality among employed individuals with higher education can increase property crime rates over time. However, higher income per capita can reduce property crime by addressing financial desperation and improving individuals' access to basic necessities. Additionally, while an increase in female labour force participation might impact crime opportunities, a comprehensive examination of societal dynamics and other influential factors is necessary to draw accurate conclusions about crime trends in Malaysia.

6. Conclusions

In conclusion, this study explores the relationship between tertiary education and property crime in Malaysia from 1982 to 2020 using the ARDL approach. The study's findings provide new insights into the potential impact of education on criminal behaviour and the need for policymakers to consider the economic circumstances of individuals with tertiary education. One of the study's most significant findings is the positive association between the female labour force and property crime rates in Malaysia, indicating that a higher female labour force can increase property crime rates. Therefore, enhancing community policing and crime prevention measures can create safer neighbourhoods. Collaborative efforts between law enforcement agencies, community organisations, and residents can deter property crime, regardless of gender. Community trust and cooperation can help identify potential crime hotspots and develop proactive strategies to prevent criminal activities.

Additionally, GDP per capita can also reduce property crime in Malaysia. Fiscal and monetary policies are two essential tools governments, and the central bank uses to influence and boost the economy. Each policy operates in distinct ways and has specific objectives. Fiscal policy refers to the government's use of taxation and public spending to influence the economy. It aims to stabilise the economy, promote economic growth, and control inflation. When the government increases its spending on infrastructure projects, public services, education, healthcare, and other programs, it injects money directly into the economy. This increased spending can create jobs, stimulate demand for goods and services, and boost economic growth. Through monetary policy, the central bank sets interest rates, specifically the benchmark interest rate, which influences borrowing and lending throughout the economy. Lowering interest rates makes borrowing

cheaper, encouraging consumer spending, business investments, and borrowing for big-ticket items like homes and cars. This increased spending and investment can stimulate economic growth.

Interestingly, the study finds that more individuals with tertiary education are associated with higher property crime rates. This finding contradicts the conventional wisdom that education protects against crime. However, it is consistent with recent research that suggests that highly educated individuals may engage in white-collar crime or property crime due to economic pressures or the desire for material possessions.

These findings have important implications for policymakers, as it suggests that tertiary education alone may not be sufficient to prevent crime and that other economic factors, such as employment opportunities and income levels, may be more important. Policymakers should consider measures that address the root causes of crime, including poverty, inequality, and economic hardship, rather than relying solely on education to prevent crime. The study's findings have broader implications for developing countries facing similar education, employment, and crime challenges. Developing countries often face higher poverty levels, unemployment, and inequality, contributing to higher crime rates.

To effectively reduce crime rates, policymakers in Malaysia should prioritise measures that foster economic growth (increased income) and enhance employment opportunities (quality jobs with fair remuneration). The study highlights the importance of observing potential aspects affecting income, such as poverty, inequality, and economic hardship, as these factors appear to be linked to criminal behaviour in similar geographies (Sugiharti et al., 2023). Individuals facing financial struggles and social disparities may turn to property crime as a means of survival or to improve their economic circumstances. To raise the overall income level, policymakers can implement targeted poverty alleviation programs, providing direct financial assistance, food subsidies, and healthcare support to those in need. Additionally, establishing conditional cash transfer programs can offer families financial incentives to invest in education and health, ultimately enhancing human capital and reducing the likelihood of resorting to crime.

Enhancing employability through job training and placement initiatives will also grant individuals access to higher-paying jobs, contributing to economic stability and reducing the motivation for criminal activities. Fiscal-related policies can benefit lower-income and marginalised groups by promoting inclusive growth and equitable distribution of wealth, fostering a more just society. Encouraging fair wages and equal pay for both men and women will further promote gender equality in the workforce, creating a more balanced and inclusive economic landscape. By implementing these comprehensive strategies, policymakers can address the underlying challenges that lead to criminal behaviour, contributing to a safer, more prosperous, and more harmonious society.

Malaysian policymakers should consider reevaluating their strategies for enhancing the employability of higher education graduates to foster improved economic prospects. This may involve revitalizing and aligning the curriculum with the current needs of industries. Encouraging student participation in internships, work experiences, and hands-on learning can boost their preparedness to enter the workforce. Conducting a comprehensive assessment of labor mismatching could be beneficial in identifying discrepancies related to qualifications, skills, occupations, or geographical factors in the job market. Additionally, if the industry fails to provide fair wages to new workers, government intervention might be necessary. This could entail implementing wage regulations, offering wage incentives, providing tax incentives, or supporting skill development that aligns with industry demands. Such interventions can create a more equitable and thriving labor market for both graduates and employers.

In conclusion, this study provides new insights into the relationship between tertiary education and property crime rates in Malaysia. The study's findings suggest that employment opportunities and inflation levels are important drivers of property crime rates, and tertiary education alone may not prevent crime. Policymakers should consider these findings when formulating policies to address crime in Malaysia and other developing countries. By addressing the root causes of crime, policymakers can create safer and more prosperous societies for all citizens.

7. Limitations and suggestions for future research

One notable limitation of the study is the lack of a comprehensive investigation into the specific types or forms of property crime that are more prevalent among individuals with tertiary education. Understanding the nature of these crimes could offer valuable insights into the underlying motivations and circumstances driving educated individuals towards criminal behaviour. Future research could delve deeper into the specific property crimes committed by this group to gain a more nuanced understanding of the phenomenon. New studies could explore the application of textual data analytics and the Naive Bayes classification system, which has proven useful in other regions. Alternatively, qualitative research methods such as interviews or surveys could be employed to investigate these crimes' motivations, circumstances, and characteristics. Such investigations would provide valuable insights for policymakers and law enforcement agencies, aiding in developing targeted crime prevention strategies.

Another limitation is the study's exclusive focus on the Malaysian context. While this provides valuable insights into the relationship between tertiary education and property crime in Malaysia, it limits the generalizability of the findings to other developing countries. Comparative analysis or case studies from similar developing nations with similar education, employment, and crime challenges would be valuable to validate and strengthen the broader implications of the research. Future research should incorporate cross-country comparative studies to enhance the generalizability of the findings. Examining the relationship between tertiary education and property crime in various developing countries with similar socioeconomic contexts would provide a broader understanding of the phenomenon and allow for identifying common trends and patterns.

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Debunking conventional wisdom: Higher tertiary education levels could lead to more property crimes in Malaysia

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Abstract

This study examines the relationship between tertiary education and property crime in Malaysia from 1982 to 2020 using the ARDL approach. The study is motivated by the concern that underpaid individuals with higher education may resort to property crime. Results reveal that the female labour

force is positively associated with burglary in the short run. Furthermore, income per capita is also found to be another contributing factor to property crime. Increased income levels and improvements in welfare schemes can contribute to reduced crime rates. Interestingly, the study finds that more individuals with tertiary education are associated with higher property crime rates. Property crime can flourish when the skills and qualifications of highly educated job seekers do not match labour needs or when suitable employment opportunities are scarce. Enhancing job quality, ensuring fair wages, appropriate job matching, and promoting a well-balanced employment environment may discourage highly educated individuals from turning to crime. Moreover, imprisonment does not act as a deterrent for property crime. The findings may be relevant for curbing property crime in other developing countries experiencing a rise in tertiary education, sluggish income growth, and low female labour participation. © 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

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crime; employment; inflation; job creation; property crime; tertiary education

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