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Does more immigration lead to more violent and property crimes? A case study of 30 selected OECD countries

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ABSTRACT

In many developed countries around the world, the connection between immigration and crime has been a subject of discussion. The indigenous populations of the most advanced nations usually held the opinion that immigration fuels delinquency. Therefore, this paper provides an empirical connection between immigration and crime in the period 1988-2018 across 30 OECD countries. For empirical analysis, advanced panel econometric approaches are used which can address both heterogonous coefficients and cross-section dependency. The findings show that no statistical evidence exists to relate an increase in the number of immigrants to the rise of any kind of crime. If there is we found a significant negative association between immigrants and only one of the six kinds of crime studied. Moreover, an increase in foreign prisoners (FP) reduces all kinds of crimes. While an increase in the real gross domestic product (RGDP) only increases property crimes. The increase in M25–29 only increases serious assault (SA) out of six crime types analysed.

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1. Introduction

Following waves of enormous immigration in the twenty-first century due to never-ending conflicts and economic recessions, the impact of immigration on crime is now a hot topic for policymakers worldwide (Kayaoglu, 2022). The world migration report (2020) shows that in 1985, around 113 million people (equivalent to 2.3% of the world population) lived in a country other than their country of birth. This value jumped to 161 million in 1995, 191 million in 2005, and 244 million in 2015. The same process has been noticed in OECD economies. The share of foreigners born in these countries has increased from 7% in 1990 to more than 12% in 2020 (Edo et al.,

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2020). Furthermore, studies in various circumstances show that one of the citizens' top worries about welcoming immigrants to their country is criminal activity (Bianchi et al., 2012; Mayda, 2006). The same perception of the local community is no different in OECD countries, which have begun organising the world's largest immigrant population due to economic crisis and civil conflict. For this purpose cross-country opinion poll was conducted by (Simon & Sikich, 2007) to examine the public understanding of the connection between immigrants and crime rates. They observed different outcomes. In Australia, 35% of respondents claimed that immigrants raise violence. The proportion was 40% in France, 64% in Germany, 72% in Japan, and 27% in the USA, while 40% in the United Kingdom.

The empirical literature on the nexus of immigrants and crime is ambiguous because it primarily focuses on the case of advanced nations and the role of volunteer migrants in criminal offenses while ignoring other regions such as the OECD countries, which are major recipients of migrant inflows from the rest of the world. As a result, to provide much-needed insights from the context of OECD countries, we examine the influence of immigrants on property and violent crime in these countries. Thereby we examined the heterogeneity in crimes rate. As a result, in this study, we investigate the hypothesis that immigration raises the criminal offense rate in 30 selected OECD economies. On the other hand, our study does not precisely depict an immigrant's loved one's proclivity for committing crimes compared to the local population. Such a direct impact could only be calculated if individual-level data on the ethnicity of perpetrators and targets in each reported incident were made publicly available. In the absence of such measures, we investigate whether immigrants impacted the occurrence of criminal offenses in the selected sample, either directly by being linked with a crime or indirectly by affecting factors that may have influenced the local population's criminality. A common issue during panel data analysis is the cross-sectional dependence and heterogeneity when examining crime data. Because the behaviour of the dependent or explanatory variable in one place may be connected with the behaviour of this variable in another neighbouring location. People staying in one location, for example, might travel to another location to commit a crime (Leiva et al., 2020). Therefore, we require a robust estimation method that can account for the interdependence of observations. Traditional econometric models can be used to estimate such analyses. But CS-ARDL approach offers a richer interpretation when there is an issue of cross-sectional dependence and heterogeneous problems in the data (Sharma & Pal, 2021).

As a result, this study contributes to discussions in the relevant academic literature about the relationship between immigration and criminal behaviour by hypothesising that immigrants increase criminal activity in the 30 OECD countries. These countries are not just important developing countries but also host the world's greatest immigrant populations within national borders. For various reasons, studying these countries is a vital contribution to the literature. Firstly, due to high labour market demand, OECD countries have recently attracted the largest conceivable average number of immigrants worldwide. Permanent migrant inflows to OECD nations have also increased, from 3.85 million in 2000 to 7.06 million in 2016. Second, multiple big geopolitical shocks have occurred in recent years, particularly in East and

Northern Africa and the middle east. In light of these events, most OECD countries have always been caught off guard by large influxes of people seeking international protection. Although the vast majority of previous studies focus on a single advanced country case almost 90% of immigrants are hosted in these economies.

The remaining sections are structured as follows.

Section 2 provides a review of the literature. Section 3 presents the methodology and theoretical framework. Section 4 outlines the econometric methodology. Section 5 describes the results and discussion. Section 6 concludes this study and highlights some policy implications.

2. Review of literature

According to the (Becker, 1968; Ehrlich, 1973) academic framework, immigrants and natives have different anticipated utility from committing a crime due to their various outside choices, which could cause immigration to influence criminal activity rates in destination nations. As a result, the economic theory of criminal offense suggests that, following the immigration inflow, one should assess the price and advantages of breaking the law for both foreigners and locals to see how immigrants will impact criminal activity rates. For example, immigrants pay a larger price for committing a crime than the native population, who, for instance, are not in danger of being expelled and have far better and faster access to job opportunities (Kayaoglu, 2022). However, for the immigrants, the expected utility from illicit activities may be higher as long as their possibilities of finding work in the legitimate market are diminished. The net effect of immigrants on the delinquency rate is also influenced by the composition effect of immigrants' inflows, which may alter natives' employment prospects. Reducing locals' outside options, for example, may increase their criminal commitment, hence raising crime rates indirectly. In general there are a lot of theoretical frameworks proposed in the literature on the impact of immigration on criminal activity.

The evidence between immigrants and crime is debateable. In some research, there is no impact of immigration on crime (Fasani, 2018; Leiva et al., 2020). While more recently some scholars believe that immigrants increase the crime rate (Alonso-Borrego et al., 2012; Kakamu et al., 2008; Piopiunik & Ruhose, 2017; Solivetti, 2018). For the justification of this argument, literature offers four possible networks through which immigrants might contribute to greater criminal activity rates in their host nations. First, if immigrants lead to demographic change, such as an increase in the population of people with a greater criminal proclivity, such as young males (Kayaoglu, 2022; Ramakers et al., 2020). Second, according to the social disorganisation theory, household turnover and population heterogeneity due to migration may raise criminal activity rates in holding areas (Ousey & Kubrin, 2009). Third, which is based on the opportunity structure theory, states that when Immigrants' inflow increase to areas where labour markets are already tight may exacerbate the labour shortage and lead to intergroup criminal activity (Messner & South, 1986). Immigration has both direct and indirect effects on crime rates. (Borjas et al., 2010) For instance found that in the United States, black men's incarceration has increased

as a result of immigration, which has resulted in a decrease in their earnings and employment. Finally, Gangs and other criminal organisations may target the youth population of immigrants for recruitment due to residential segregation or their out-of-proportion migration to the poor region in the country of destination (Martinez, 2002).

On the other hand, several studies have found that immigrants may lower crime rates (Adelman et al., 2020; Ferraro, 2016; Gunadi, 2021; Kayaoglu, 2022; Light & Miller, 2018; McCann & Boateng, 2020; Ousey & Kubrin, 2014). The previous literature argues that the price of breaking the law for immigrants is the most visible source of support for these issues. It claims that because all immigration entails significant ex-ante and ex-post expenditures, migrants' involvement in illicit activities runs the risk of turning all of that spending into a sunk cost if they are deported, by letting them less probably to breach the law (Butcher & Piehl, 2007). Another justification may be the police's ability to combat and prevent criminal activity. For instance, in the face of massive immigrant surges, a government would invest in strengthening its police force; it will almost certainly ensure that criminal activity is reduced not only among newcomers but also among the native community. In contrast to the social disorganisation theory, immigrants can revive their new communities by giving socioeconomic benefits such as scientific breakthroughs, artwork, and new enterprises, or simply by filling job and housing vacancies that aren't being filled by locals (Kayaoglu, 2022; Sampson, 2017).

Therefore, the net impact of immigration on the crime rate is unclear when we consider all the previous literature. The summary of the most relevant and mandatory reviewed studies are presented in (Table A1). Based on the empirical literature, the results differ because of various time intervals, methods, datasets, and countries. The scholars accept that the picture is still not finished and also, there is a specific need for further investigation of the macro-level impact of immigration on crime rates. In the case of OECD countries, the empirical research regarding immigrants and crime is still limited and rare. Because mostly the previous research mainly focuses on single advanced countries. Building upon prior research, we hypothesise that immigrants increase violent and property crime in these 30 selected OECD countries. As for as we know, this is the first article to scrutinise immigration and crime relations in 30 highly receiving immigrants OECD countries.

3. Methodology and theoretical framework

3.1. Data

This paper uses panel data of 30 OECD countries[1] for 31 years, i.e., from 1988 to 2018. (Fajnzylber et al., 2002; Furqan & Mahmood, 2020) they specified that Panel data is a rich and dynamic approach for studying various problems and underlying components. It enables the writer to make his/her argument more general, strengthens the outcomes' validity and helps to draw clear, logical inferences. This study has 6 dependent variables, homicide, serious assault, kidnapping, burglary, theft, and car theft. Homicide, serious assault, and kidnapping constitute violent crimes, while burglary theft and car theft constitutes property crimes. We collect the data regarding all kinds of crimes from the United Nations Office on Crime and Drugs (UNOCD) and

the European sourcebook of crime and criminal justice statistics (ESB). The regressors include foreigners, foreigner prisoners, Male population aged 25–29. Data related to foreigners collect from the organisation for economic cooperation and development (OECD) statistics. Furthermore, data related to foreign prisoners collect from the United Nations Office on Crime and Drugs (UNOCD). Due to the limitation of data, we take the overall foreigner prisoner populations. We couldn't collect the foreigner prisoner's number for each category of the crime. Furthermore, we affirm that the total foreigner prisoner population accommodates all types of criminals, meaning that our target criminals are present in the total foreigner prison populations'. The information on real gross domestic product and the male population ages 25-19 were taken from World Development Indicator (WDI). Due to data limitations, the information cannot be updated to the most recent year 2020. 2018 is the latest year where data is available in a whole year's figures.

3.2. Theoretical framework

Based on the earlier literature, we employ various explanatory variables. Primary we employ the inflow of foreign population by nationality (Foreigners) FR reported by the OECD statistics. There is controversial evidence between crime and the number of the foreign population. Some studies indicate there is a positive, negative, or no relationship between immigrants and crime (Leiva et al., 2020; Light & Miller, 2018; Piopiunik & Ruhose, 2017). If immigrants and indigenous peoples, for instance, have different violent tendencies, then immigration would increase crime rates directly. The economic theory of crime (Becker, 1968; Ehrlich, 1973) argues this could happen since immigrants and indigenous people experience numerous legal prospects for earning. Furthermore various chances of being prosecuted and different prosecution costs. Bianchi et al. (2012) and Binder and Bound (2019) note that immigrants face poorer labour market conditions in advanced countries, which would predict a higher propensity for crime. Mostly the immigrants earn less compared to native populations. This is because they are very young, poor skilled labour. As a result, various demographic structures and lower legal income prospects would indicate that immigrants in OECD countries are more likely to commit crimes than local citizens. There are, however, other factors that may reduce the tendency of immigrants to crimes. Specifically, immigrants in OECD countries face a dramatically higher cost of crime than native people. This is due to the high probability of detention. According to the justice system of OECD countries, most of the foreigners in prison served definitive sentences. Also, they usually have less recourse to alternative measures, such as house arrest, even after a final sentence. This is because most foreigners are frequently not able to display an authorised domicile in the host land. Therefore immigrants in OECD countries are less likely to commit crimes. We build the hypothesis that immigrants increase different kinds of crime rates. Therefore we predict that there is a positive relationship between immigrants and crime. The second explanatory variable is foreigner prisoners, one of the core instruments for deterrence factors. A larger number of inmates decreases the crime rate just because many people are being put in prison. Asad (2020) and Bianchi et al. (2012) stress that punishment implemented

on immigrants involves the possibility of deportation, which can be an effective deterrent to illegal acts. Therefore we expect a negative relationship between the crime rate and foreign prisoners.

We use the real gross domestic product as the third explanatory variable for each country reported by World Development Indicator (WDI). Higher-income levels are correlated with higher incentives for offenders because of increasingly lucrative target opportunities. Therefore we anticipate that a rise in income will rise crimes, mainly those of an economic nature. The last explanatory variable is the male population ages 25–29. This variable is introduced because young people make up the bulk of those incarcerated in OECD countries. Empirical work has confirmed that young men are more actively participating in specific crimes (Ozden et al., 2018; Ramakers et al., 2020). This is because the opportunity costs for young men to commit a crime are substantially smaller than their elder colleagues. Younger men have lower earnings on average as compared to their elder colleagues. When they are arrested, they will lose less monetary benefit.

This analysis offers a general specification of the model based on our aforementioned theoretical model, which is as follows:

$$HM_{i,t} = f(FR_{i,t},\ FP_{i,t},\ RGDP_{i,t}, M25-29_{i,t}) \tag{1}$$

$$SA_{i,t} = f(FR_{i,t},\ FP_{i,t},\ RGDP_{i,t}, M25-29_{i,t}) \tag{2}$$

$$KD_{i,t} = f(FR_{i,t},\ FP_{i,t},\ RGDP_{i,t}, M25-29_{i,t}) \tag{3}$$

$$BG_{i,t} = f(FR_{i,t},\ FP_{i,t},\ RGDP_{i,t}, M25-29_{i,t}) \tag{4}$$

$$TH_{i,t} = f(FR_{i,t},\ FP_{i,t},\ RGDP_{i,t}, M25-29_{i,t}) \tag{5}$$

$$CT_{i,t} = f(FR_{i,t},\ FP_{i,t},\ RGDP_{i,t}, M25-29_{i,t}) \tag{6}$$

Basic regression equations for all three functions are given below:

$$HM_{i,t} = \pi\ {}^{1}_{i}FR_{i,t} + \pi\ {}^{1}_{i}\ FP_{i,t} + \ \pi\ {}^{1}_{i}RGDP_{i,t} + \pi\ {}^{1}_{i}M25-29_{i,t}\ \ + \varepsilon_{i,t} \tag{7}$$

$$SA_{i,t} = \pi\ {}^{1}_{i}FR_{i,t} + \pi\ {}^{1}_{i}\ FP_{i,t} + \ \pi\ {}^{1}_{i}RGDP_{i,t} + \pi\ {}^{1}_{i}M25-29_{i,t}\ \ + \varepsilon_{i,t} \tag{8}$$

$$KD_{i,t} = \pi\ {}^{1}_{i}FR_{i,t} + \pi\ {}^{1}_{i}\ FP_{i,t} + \ \pi\ {}^{1}_{i}RGDP_{i,t} + \pi\ {}^{1}_{i}M25-29_{i,t}\ \ + \varepsilon_{i,t} \tag{9}$$

$$BG_{i,t} = \pi\ {}^{1}_{i}FR_{i,t} + \pi\ {}^{1}_{i}\ FP_{i,t} + \ \pi\ {}^{1}_{i}RGDP_{i,t} + \pi\ {}^{1}_{i}M25-29_{i,t}\ \ + \varepsilon_{i,t} \tag{10}$$

$$TH_{i,t} = \pi\ {}^{1}_{i}FR_{i,t} + \pi\ {}^{1}_{i}\ FP_{i,t} + \ \pi\ {}^{1}_{i}RGDP_{i,t} + \pi\ {}^{1}_{i}M25-29_{i,t}\ \ + \varepsilon_{i,t} \tag{11}$$

$$CT_{i,t} = \pi\ {}^{1}_{i}FR_{i,t} + \pi\ {}^{1}_{i}\ FP_{i,t} + \ \pi\ {}^{1}_{i}RGDP_{i,t} + \pi\ {}^{1}_{i}M25-29_{i,t}\ \ + \varepsilon_{i,t} \tag{12}$$

In Equations (7)–(12) all the dependent variables are given on the left side. While the explanatory variables are given on the right side of the equations. Furthermore, i is for cross-sections that are 30 OECD countries and t is for a time that is the period 1988 to 2018.

4. Econometric methodology

4.1. Cross-section dependence and slope heterogeneity

When using crime panel data, a common issue is that the probability of different cross-sections has to be dependent on one another. In the case of the unit root test and long-run cointegration test, it is compulsory to apply an advanced econometric technique like the cross-section dependency test. Thus, this study used the CSD (Pesaran, 2004) test to check the existence of cross-sectional dependency. The general equation for (Pesaran, 2004) CSD test is given as:

$$CSD = \sqrt{\frac{2T}{N(N-1)N}\left(\sum_{i=1}^{N-1}\sum_{K=i+1}^{N}\widehat{Corr}_{i,t}\right)} \tag{13}$$

The pairwise correlation is obtained in Equation (1) via OLS and indicated $\widehat{Corr}_{i,t}$. The null hypothesis of the cross-section dependence test suggests independence among units and vice-versa. It must be noted that slope parameters are likely to be heterogeneous. This is due to socio-economic, different economies, and demographic differences (Tufail et al., 2021; 2022). For this reason heterogeneity test introduced by Swamy (1970) and later modified by Pesaran and Yamagata (2008) is being used.

4.2. Panel unit root and cointegration test

It is difficult for conventional unit root tests to solve the issue of cross-section dependence and slope heterogeneity among units. Thus, it is important to apply appropriate econometric models that are capable of addressing all of the aforementioned issues. For this reason, the cross-section augments CIPS test is applied which is designed by Pesaran (2007). This method, in particular, overcomes cross-sectional dependency by added lags and makes the first difference by cross-section augmentation and averaging. The general CIPS test form is given as

$$\Delta Y_{i,\ t} = \gamma_i + \gamma_i Y_{i,t-1} + \gamma_i \overline{X}_{t-1} \sum_{l=0}^{P} \gamma_{il}\Delta\overline{Y}_{t-1} + \sum_{l=1}^{P}\gamma_{il}\Delta Y_{i,t-1} + \varepsilon_{it} \tag{14}$$

In Equation (14) $\overline{Y}_{t-1}$ and $\Delta\overline{Y}_{t-1}$ represents lagged and first differences averages. The statistics for the CSIMPS test are given as:

$$CIPS = \frac{1}{N}\sum_{i=1}^{n} CADF_i \tag{15}$$

In Equation (15) the CADF represents cross-sectionally augmented Dickey-Fuller and is used with Equation (14). The null hypothesis support non-stationarity while the alternative for stationarity. The long-run panel cointegration association among 6 types of crime, foreigners, foreigner prisoners, real gross domestic product, and male population ages 25–29 is estimated by using an error correction-based test (Westerlund, 2007). When errors are not cross-sectionally independent and slope coefficients are heterogeneous, this test is useful. Thus it is important to apply the Westerlund panel cointegration approach before obtaining the short and long-run estimation. This test is generally defined as follows:

$$G_{\alpha} = \frac{1}{N}\sum_{i=1}^{N}\frac{\acute{\alpha}_i}{SE(\acute{\alpha}_i)} \tag{16}$$

$$G_{t} = \frac{1}{N}\sum_{i=1}^{N}\frac{T\acute{\alpha}_i}{\acute{\alpha}_i(1)} \tag{17}$$

$$P_{T} = \frac{\acute{\alpha}}{SE(\acute{\alpha})} \tag{18}$$

$$P_{\alpha} = T\acute{\alpha} \tag{19}$$

Group statistics in Equations (16) and (17) are represented by G_{α} and G_{t}while panel statistics represent P_{T} and P_{α}. Group means statistics and panel statistics indicate no cointegration in the null hypothesis. While in the alternative theory, group statistics suggest that at least the cross-section is cointegrated. The alternative hypothesis in panel statistics confirms cointegration for the entire panel.

4.3. Cross sectionally augmented autoregressive distributed lags (CS-ARDL)

For the short-run and long-run cointegration outcomes, this study employs a rigorous approach known as cross-section augmented autoregressive distributed lags (CS-ARDL). This method was first implemented by Chudik and Pesaran (2015). This method is more robust and advanced than the traditional correlated effect mean group (CCEMG), augmented mean group (AMG), and pooled mean group. CS-ARDL can solve 1) the problem of heterogeneous slope coefficients and endogeneity 2) it provides robust results even with a problem of cross-section dependence 3) It works well even when there is a mixed integration order or a non-stationarity problem. By using cross-section averages, cross-section dependence is eliminated. The CS-ARDL general form is given as:

$$\Delta Y_{i,\ t} = \alpha_i + \sum_{l=1}^{P}\alpha_{i,t}\Delta Y_{i,t-1} + \gamma_i\overline{X}_{t-1}\sum_{l=0}^{P}\alpha_{i,t}EXV_{s,i,t-1} + \sum_{l=0}^{1}\alpha_{i,t}\overline{CSA}_{i,t-1} + \varepsilon_{it} \tag{20}$$

where $\overline{CSA}_t$=(ΔY_t, $EXV_{s,t}$) and $EXV_{s,t} = (FR_{i,t},\ FP_{i,t},\ II_{i,t}, M25-29_{i,t})$ that is, EXV, s is the set of explanatory variables, namely foreigners, foreigners prisoners, real gross domestic product, and the male population ages 25–29.

5. Results and discussion

5.1. Crime trends in OECD countries (1988-2018)

Figure 1 shows the violent and property crime rate in 30 OECD countries from 1988 to 2018. Violent crimes include homicide, serious assault, and kidnapping. Property crimes include burglary, theft, and car theft. It is observed that the recorded violent and property crime rate decreased in the study period. However, it increases in some years and then gradually decreased. From 1988 to 2001 the violent crime rate rose, reaching its top in 2001 with a crime rate of 85251. The rate started to decline after 2001 and continued to fall until 2014. It is observed that the lowest violent crime rate found in 2014 is 47890. After 2014 it slightly increases till 2018. In the case of property crime, the highest crime rate is recorded in 1992 which is 944,435. After 1992 the crime rate continuously decreases till 2018. The lowest property crime rate is recorded in 2018 which is 529,000 persons. Changes in government administration and various crime policies in OECD countries may be a potential reason for the decline in violent and property crimes in the years described.

5.2. Descriptive statistics

Table 1 presents descriptive statistics and measurements of the essential variables used in this paper. On average, property offenses account for an enormous proportion of the total crime rates in OECD countries. In the case of property crime, theft is the highest crime reported on average, with 517,926.3 cases per 100,000 people, followed by burglary and car theft. In violent crimes, serious assault shows the highest number of crimes reported on average, with 67,811.8 cases per 100,000 population, followed by homicide and kidnapping. It should be noted that the highest crime reported is theft, while the lowest crime reported is kidnapping. Furthermore, the descriptive statistics of the explanatory variables are foreigners, foreigner prisoners,

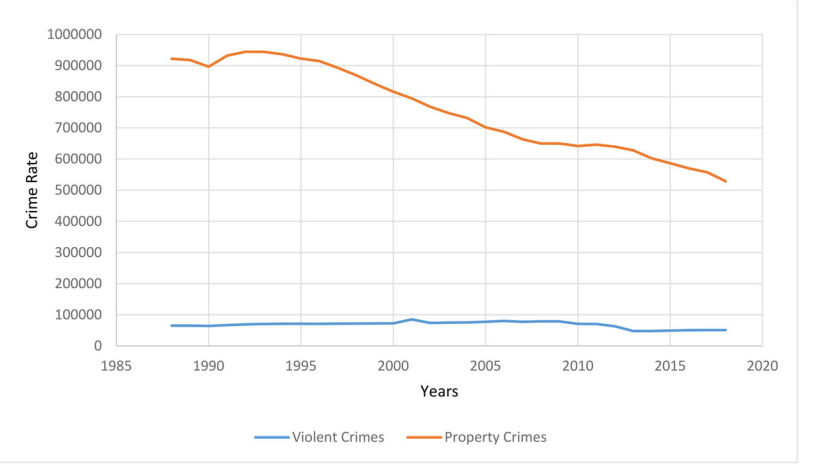

Figure 1. Trends in violent and property crimes 1988–2018.
Source: Authors elaboration based on 30 (OECD) Countries panel data from the united nation office on Drugs and Crime (UNODC) and European sourcebook of crime and criminal justice statistics (ESB).

Table 1. Descriptive statistics.

Variables	Measurement	Mean	S.D	Maximum	Minimum	Skewness	Kurtosis	Jarque-Bera	Pb
Dependent variables									
Homicide (HD)	Number of police-recorded homicide counts per 100,000 people	1476.6	4567.2	36,685.0	0.0000	1.05	1.78	3.78	0.46
Serious Assault (SA)	Number of Serious assault incidents counts per 100,000 persons	67,811.8	165,496.7	998,535.0	50.00	1.03	1.82	3.09	0.44
Kidnapping (KD)	Number of burglary incidents counts per 10,000 persons	964.6247	3390.881	35,281.0	0.0000	1.88	2.08	1.50	0.74
Burglary (BG)	Number of burglary offenses counts per 100,000 persons	179,778.4	404,874.6	2,746,190	501.0	1.85	2.05	2.63	0.59
Theft (TH)	Number of police-recorded theft offenses per 100,000 people	517,926.3	1,311,375	8,798,909	952.0	1.71	2.72	2.58	0.76
Car Theft (CT)	Number of police recorded Car theft counts per 100,000 population	87,116.22	216,074.8	1,464,381	31.0	2.62	2.88	2.35	0.57
Explanatory variables									
Foreigners (FR)	Total Inflows of foreigners by countries	108,450	192,599.0	1,266,129	759.0	1.41	1.82	3.10	0.45
Foreigner Prisoners (FP)	Number of foreign citizens held in prison	8432.4	28,119.49	202,908.9	8.00	1.20	2.09	1.18	0.62
Real Gross Domestic Product (RGDP)	The final value of all the goods and services that are produced within the boundaries of a country at a specific time (Constant US dollar 2015)	1.03E + 12	2.65E + 12	1.96E + 13	9.14E + 09	1.83	2.43	2.82	0.47
Male population ages 25–29 (M25–29)	The Male population between the ages of 25 to 29 as a percentage of the total male population	7.535	0.924	10.40	5.23	0.02	1.67	4.21	0.12
No of observations		930							

Source: Authors elaboration based on the United Nations Office on Drugs and Crime, a European sourcebook of crime and criminal justice statistics, World development indicators, and OECD statistics.

Note. S.D and Pb represent standard deviation and probability in the parenthesis.

real gross domestic product, and the male population aged 25–29. We observed that each nation has an average of 108,450.6 foreigner persons.

5.3. Regression results

Table 2 shows estimated outcomes of cross-section dependence and slope heterogeneity. The null hypothesis for cross-section independence is rejected at a 1 percent significance level. The outcomes suggest that there is dependency among cross-section units. The dependency is mainly due to continuous immigration and growing trade between OECD countries and the rest of the world. Furthermore, the null hypothesis of homogeneous slope coefficients is firmly rejected, i.e., at 1 percent, based on the Pesaran and Yamagata (2008) tests. On the other hand, the results confirmed heterogeneity between cross-section slope coefficients. As previously discussed, heterogeneity mainly occurs due to several factors like socioeconomic and demographic. Consequently, conventional unit root tests cannot be applied. Because of its low power and inefficiency in coping with the above issue.

Table 3 shows unit root test results. We applied a suitable and robust unit root test (Pesaran, 2007) which can deal with both CSD and heterogeneity issues. The results confirm that all the variables become stationary at the first difference that is

Table 2. Cross Section dependence and slope heterogeneity results.

Pesaran CSD-test	
Variables	Statistics
HD	23.885***
SA	18.066***
KD	0.697
BG	26.575***
TH	12.641***
CT	36.92***
FR	50.752***
FP	6.582***
RGDP	107.981***
M25–29	20.564***
Slope heterogeneity test	
$HM_{i,t} = f(FR_{i,t},\ FP_{i,t},\ RGDP_{i,t}, M25-29_{i,t})$	
Δ	10.813***
Δ Adjusted	12.192***
$SA_{i,t} = f(FR_{i,t},\ FP_{i,t},\ RGDP_{i,t}, M25-29_{i,t})$	
Δ	30.256***
Δ Adjusted	32.016***
$KD_{i,t} = f(FR_{i,t},\ FP_{i,t},\ RGDP_{i,t}, M25-29_{i,t})$	
Δ	1.223
Δ Adjusted	1.420
$BG_{i,t} = f(FR_{i,t},\ FP_{i,t},\ RGDP_{i,t}, M25-29_{i,t})$	
Δ	34.521***
Δ Adjusted	38.522***
$TH_{i,t} = f(FR_{i,t},\ FP_{i,t},\ RGDP_{i,t}, M25-29_{i,t})$	
Δ	26.320***
Δ Adjusted	29.315***
$CT_{i,t} = f(FR_{i,t},\ FP_{i,t},\ RGDP_{i,t}, M25-29_{i,t})$	
Δ	23.469***
Δ Adjusted	26.047***

Note. Asterisks *, **, *** are for 10 percent, 5 percent, and 1 percent statistical significance level.
Source: Authors calculations.

Table 3. Unit root test (Pesaran, 2007).

	Level I(0)		The first difference I(1)	
Variables	Constant	Constant with trend	Constant	Constant with trend
HD	−2.056	−2.175	−5.660***	−5.849***
SA	−1.285	−2.437	−4.598***	−4.667***
KD	−2.009	−2.411	−4.922***	−5.189***
BG	−1.454	−1.929	−4.133***	−4.123***
TH	−1.775	−1.983	−4.307***	−4.482***
CT	−1.922	−2.214	−4.163***	−4.195***
FR	−1.962	−2.298	−4.652***	−4.762***
FP	−1.807	−2.219	−4.135***	−4.287***
RGDP	1.944	−2.581	−2.581***	−4.325***
M25–29	−0.372	−0.921	−2.996***	−3.647***

Note. Asterisks *, **, *** are for 10 percent, 5 percent, and 1 percent statistical significance levels.
Source: Authors calculations.

Table 4. Cointegration results (Westerlund, 2007).

Models	Statistics	Value	Z-statistics	P-value
Model-1	G^t	−8.295***	−25.890	0.000
	G^a	−25.034***	−11.321	0.000
	P^t	−22.098***	−9.987	0.002
	P^a	−21.645***	−10.632	0.000
Model-2	G^t	−6.234***	−17.941	0.000
	G^a	−15.098***	−3.153	0.000
	P^t	−36.901***	−21.005	0.005
	P^a	−26.021***	−13.023	0.000
Model-3	G^t	−7.341***	−21.101	0.009
	G^a	−19.986***	−7.011	0.000
	P^t	−34.023***	−18.021	0.000
	P^a	−7.544	−0.291	0.412
Model-4	G^t	−5.234***	−12.333	0.000
	G^a	−15.231***	−3.012	0.000
	P^t	−20.982***	−8.043	0.003
	P^a	−11.023***	−3.121	0.000
Model-5	G^t	−5.932***	−16.307	0.000
	G^a	−15.898***	−3.121	0.000
	P^t	−21.954***	−9.501	0.000
	P^a	−13.126***	−4.055	0.000
Model-6	G^t	−5.078***	−15.219	0.000
	G^a	−15.765***	−3.123	0.000
	P^t	−10.132***	−8.010	0.000
	P^a	−12.998***	−4.032	0.008

Note. Asterisks *, **, *** are for 10 percent, 5 percent, and 1 percent statistical significance levels.
Source: Authors calculations.

I(1), which shows that all the variables, that is, HD, SA, KD, BG, TH, CT, FR, FP, RGDP, and M25–29 are stationary after taking their difference.

Table 4 shows long-run cointegration results for all the six models by using the Westerlund (2007) test. The results for Model-1, which treats HD as a dependent variable followed by independent variables such as FR, FP, RGDP, and M25–29 confirm long-run cointegration at a 1 percent significance level. Similarly, SA, KD, BG, TH, and CT with similar independent variables verified long-run cointegration at a 1 percent significance level.

This study used the short run and long run econometric technique CS-ARDL for all six models. The results of CS-ARDL are shown in Table 5. The short-run results indicate that immigrants have no significant relationship with considered crimes in

Table 5. Empirical results (CS-ARDL).

Short-run						
Variables	*Model-1* HD Coefficients [Std.Error]	*Model-2* SA Coefficients [Std.Error]	*Model-3* KD Coefficients [Std.Error]	*Model-4* BG Coefficients [Std.Error]	*Model-5* TH Coefficients [Std.Error]	*Model-6* CT Coefficients [Std.Error]
ΔFR	−0.061	0.058	0.049	0.051	−0.055	0.062
	[0.042]	[0.023]	[0.029]	[0.034]	[0.028]	[0.023]
ΔFP	−0.099***	−0.082***	−0.092***	−0.084***	−0.091***	−0.089***
	[0.001]	[0.015]	[0.014]	[0.013]	[0.015]	[0.024]
ΔRGDP	0.062	0.052	0.059	0.069***	0.0480***	0.0476***
	[0.042]	[0.043]	[0.019]	[0.015]	[0.013]	[0.011]
ΔM25–29	0.0754	0.054	0.0786	0.075***	0.0825	0.0985
	[0.042]	[0.032]	[0.042]	[0.021]	[0.057]	[0.056]
ECM(-1)	−0.990***	−0.901***	−0.999***	−0.987***	−0.986***	−0.991***
	[0.214]	[0.219]	[0.331]	[0.224]	[0.234]	[0.223]
Long-run						
	Coefficients [Std.Error]	Coefficients [Std.Error]	Coefficients [Std.Error]	Coefficients [Std.Error]	Coefficients [Std.Error]	Coefficients [Std.Error]
FR	−0.143***	0.071	0.055	0.054	−0.059	0.068
	[0.041]	[0.045]	[0.033]	[0.035]	[0.031]	[0.049]
FP	−0.114***	−0.083***	−0.095***	−0.099***	−0.098***	−0.091***
	[0.034]	[0.024]	[0.028]	[0.015]	[0.019]	[0.024]
RGDP	0.068	0.061	0.064	0.070***	0.051***	0.052***
	[0.048]	[0.041]	[0.048]	[0.015]	[0.013]	[0.010]
M25–29	0.081	0.056***	0.091	0.085	0.091	0.099
	[0.042]	[0.010]	[0.052]	[0.045]	[0.051]	[0.068]

Note. Asterisks *, **, *** are for 10 percent, 5 percent, and 1 percent statistical significance levels.
Source: Authors calculations.

all six models. It suggested that at the early stages of immigration, it does not affect, HD, SA, KD, BG, TT, and CT. Furthermore, an increase in FP will reduce the crime rate for all crime types. These results support the findings of Leiva et al. (2020). As the prison population is one of the core indicators of the deterrence variable, which simply means punishment. Due to this, the cost of the crime increased, and people were afraid to commit crimes.

The real gross domestic product case has a positive relationship with BG, TT, and CT while there are no statistically significant effects on HD, SA, and KD. Moreover M25–29 increases only BG while there is no statistically significant effect on HD, SA, KD, TT, and CT in the short run. The error correction term shows that policies regarding homicide, serious assault, kidnapping, burglary, theft, car theft, immigrants, foreigner prisoners, real gross domestic product, and male population ages 25–29 will play a role in more than 1 year namely in the long run.

Model-2, model-3, model-4, model-5, and model-6 signs for the long-run and short-run outcomes are the same. It means that there is no statistically significant relationship between immigrants and the considered crimes in the long run. However, the long-run results for model-1 indicate a negative relationship between immigrants and homicide and the sign of the estimated coefficient is negative. This means that a 1 percent increase in immigrants will decrease 0.143 percent homicide in the selected OECD countries. Our findings for immigrants support the earlier findings of Chalfin (2014), Kayaoglu (2022), Leiva et al. (2020), Light and Miller (2018), Martinez et al. (2010), Ousey and Kubrin (2018) and Spenkuch (2014). These scholars

also found insignificant effects or negative effects on immigration and crime rates. We further affirm that our estimation is consistent with those researchers who build the link between literacy level and different sorts of crime rates, according to the economic model of crime described by Becker (1968) that higher educational attainment enhances legal output changes in the labour market. Furthermore, decreasing the incentives to engage in illegal activities. Literacy also plays a crucial factor in boosting immigrants' social and economic integration process. In general, better-trained immigrants are expected to find a job quicker and better-paid occupations should be able to use them, which will reduce their motivations to engage in crime. Therefore, mostly on average, immigrants' literacy rate and skills are higher than the average skills and literacy rate of the native-born in OECD countries.

In long-run analysis Model-1, model-2, model-3, model-4, model-5, and model-6 FP has statistically significant at a 1 percent level and the signs of coefficients are negative. This shows that a 1 percent increase in prison population decreases HD by 0.114% points, SA by 0.083% points, KD by 0.095% points, BG by 0.099% points, TT by 0.098% points, and CT by 0.091% points respectively. The foreigner prison population reduces the crime rate, mainly based on the "incapacitation effect," meaning that criminals will not commit crimes in prison at least not in general places. Furthermore, it must be noted that when foreigners are accused in prison, they have very weak family ties in the host countries, and also there is a high chance of deportation. Therefore, the high prison population in OECD countries leads to reduced crime rates. Similar results were found by Han et al. (2013) and Kovandzic and Vieraitis (2006).

Interestingly, in the long run analysis, the real gross domestic product has been statistically significant at a 1 percent level for, BG, TT, and CT, respectively. While there are statistically insignificant outcomes of real gross domestic product on HD, SA, and KD. In the case of BG, TT, and CT the sign of the estimated coefficients is positive. This shows that a 1% point increase in the country's real GDP increases the BG by 0.070% points, TT by 0.051% points, and CT by 0.052% points respectively. This means that increase in income there is a greater opportunity for culprits as for burglaries, thefts, and car thefts. It can also be meaning that wealthy places attract more offenders. Due to this opportunity, the offenders can target those economically in nature crimes. Here our results strongly support the theory of crime (Becker, 1968) which suggests that most offenders do crimes for economic purposes, particularly property crimes. These findings are consistent with Leiva et al. (2020) and Scorzafave and Soares (2009).

Finally, the M25–29 have statistically significant at a 5 percent level only for SA and the sign of the estimated coefficient is positive. However, the effect is not statistically significant for HD, KD, BG, TH, and CT. In the case of SA, it shows that a one percent increase in the male population having aged between the intervals of 25 to 29 years increases SA by 0.056 percentage points. Young people are more vulnerable to criminal activities than children and adults due to economic pressure and a luxurious lifestyle. Comparatively younger people get lower earnings or are unemployed than their older counterparts. Hence when it comes to foregone income, they have nothing to lose but participate in criminal activities. In our analysis out of six variables, only SA is affected by M25–29. Serious assault contributes a minor

Table 6. Robustness check using AMG.

Variables	Model − 1 Coefficients	Model − 2 Coefficients	Model − 3 Coefficients	Model − 4 Coefficients	Model − 5 Coefficients	Model − 6 Coefficients
FR	−0.218***	0.438	−0.891	−0.005	−0.063	−0.248
FP	−0.305***	−0.043***	−0.02***	−0.004***	−0.099***	−0.013***
RGDP	0.629	0.394	1.035	1.296***	0.511***	1.763***
M25–29	0.795	0.083***	0.012	0.192	0.109	1.466
FD	0.673	0.019	0.467	0.082**	0.034***	0.164**
INF	−0.011	0.019	−0.095	0.009***	0.011***	0.037***
PPG	1.522	0.019	0.201	0.309***	0.076***	0.786***

Note. Asterisks *, **, *** are for 10 percent, 5 percent, and 1 percent statistical significance levels.
Source: Authors calculations.

portion of our six selected crime rates. Therefore we can say that the overall effect of M25–29 on the crime rate is statistically insignificant (with SA being an exception). Similar results are reported by Han et al. (2013) and Leiva et al. (2020), who also found a minor effect of the young male population on different crime rates.

In this study, we use the augmented mean group (AMG) method to check robustness. The results of the AMG method presented in Table 6 are consistent with the findings of the CSARDL method. The empirical results of the AMG method indicate that out of six different types of crime immigrants have only a negative association with homicide (HD). Furthermore, the AMG method indicates that foreigner prisoner (FP), real gross domestic product (RGDP), Male population ages 25–29 (M25–29), and the other control variables such as financial development (FD), inflation (INF), and population growth (PPG) are important factors explaining violent and property crimes.

6. Conclusion and recommendations

The bulk of previous research has been confined to single-country studies and conventional econometric approaches. Unlike previous research, this article employs an advanced econometric methodology and examined the hypothesis that immigration raises crime rates in thirty highly receiving immigrants in OECD countries. The empirical outcomes confirm long-run cointegration between immigrants, foreign prisons, real GDP, M25–29, and various types of crime rates. Based on our CS-ARDL results we rejected the hypothesis which believes that the inflow of immigrants boosts the crime rate. Moreover, we found that in the short-run estimates an increase in immigration has only a negative effect on homicide (HD), while the long-run estimates also confirm the negative but significant relationship between immigrants and homicide (HD) out of six crime types. The foreigner prisoner (FP) decreases all six kinds of crimes, while the real GDP increases only property crime such as BG, TT, and CT respectively. In contrast, the M25–29 increases only serious assault (SA) out of the six targeted crime types.

6.1. Policy implications

Based on our outcome, we recommend that the emphasis on controlling and also lowering crime needs not be connected with closing boundaries for the immigrant people. Because there is no proof sustaining that their arrival boosts criminal activities. Rather, the focus should be concentrated on the police and also the judicial

system in various other areas, such as police departments and also inspections services, to raise effectiveness and also lower criminal activities. Our findings also show that higher deterrence costs for immigrants may reduce their proclivity to commit crimes that could result in putting them in the prison or the probability of deportation. As a result, immigrant punishment to put in prison or deported in OECD countries is a powerful deterrent. Second, in OECD economies immigrants have lower employment and poor work condition (Beňuška & Nečas, 2021). Furthermore their families' economic dependence on them may deter them from committing a crime, since it would jeopardise their families' wellbeing (Kayaoglu, 2021). Third, in OECD countries, the residential segregation of immigrants is higher than labour market segregation (Bertoli et al., 2021). Although this may imperil social communication in the area, it's also worth noting that residential segregation, as well as continued low levels of daily contact between immigrants and natives, may contribute to misperceptions that immigrants boost delinquency. As a result, it is recommended that OECD countries can benefit from these immigrants to address the issue of misunderstanding. Immigrants can help destination countries with significant skills shortages modernise their production structure and progress up the global value chain by increasing the supply of human capital. Immigrant labour pressure can alter or include native-born workers in low-skilled areas of the economy, in addition to the needs for medium- and high-skilled employees. In this way, immigrants can play a vital role in labour market development in OECD countries.

6.2. Limitation and future guidelines

Finally, we want to talk about the limitations of our research study and how they could motivate future research. Initially, the entire OECD countries were considered a target area for this research. Despite that due to data limitations the selection was cut to 30 from 37 countries. A future study that includes one of the most recent modifications, such as the Russia-Ukraine War and the COVID-19 economic crisis, would undoubtedly be worth considering. Another factor is that we limited our research to the OECD countries. The findings of this research study can be applied to other groups of countries in the future, such as the G7, G8, and G20. One may also examine the joint role of the foreigner prison population and detection rate on various kinds of crime rates.

Conflict of interest

The authors declare that they have no conflict of interest.

Note

1. These countries are Australia, Austria, Chile, Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungry, Iceland, Ireland, Itlay, Japan, Latvia, Luxembourg, Mexico, Netherland, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, and United States.

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Appendix

Table A1. Summary of reviewed studies.

Author(s) name	Country/countries	Time span	Methodology	Major findings
(Piopiunik & Ruhose, 2017)	Germany	1996–2006	Fixed effect regression analysis	↑IM- CR↑
(Solivetti, 2018)	103 Italian Provinces	1995,1998, 2002,2005	Fixed effect Regression analysis	↑IM- CR↑
(Kakamu et al., 2008)	47 counties in Japan	1991–2001	Spatio-temporal Bayesian models	↑IM- CR↑
(Alonso-Borrego et al., 2012)	Spain	1999–2009	Panel data methods	↑IM- CR↑
(Leiva et al., 2020)	Turkey	2005–2015	SDM Model	↑IM- CR ○
(Fasani, 2018)	Italy	1990–2005	SAR, SEM Model	↑IM- CR ○
(Gunadi, 2021)	US states	2006–2015	Instrumental Variable (IV) approach	↑IM- CR↓
(Adelman et al., 2020)	US metropolitan area	2011–2015	OLS Model	↑IM- CR↓
(Light & Miller, 2018)	US States	1990–2014	Fixed Effect Regression Model	↑IM- CR↓
(Ousey & Kubrin, 2014)	US 156 cities	1980–2010	Fixed effect negative binomial Model	↑IM- CR↓
(McCann & Boateng, 2020)	USA	2016 Survey	Weighted Binary Logistic Regression	↑IM- CR↓
(Ferraro, 2016)	USA	2005–2007	Fixed Effect Regression analysis	↑IM- CR↓
(Kayaoglu, 2022)	Turkey	2009–2018	Instrumental variable, DID & staggered DID method	↑IM- CR↓

Notes. ↑and ↓ presents increase and decrease, respectively. ○ -no effect or very minor effect, IM-Immigrants, CR-Crime Rate, SDM- spatial Durbin model, SAR- Spatial autoregressive, SEM- Spatial error model, OLS- Ordinary Least Square, DID- Difference-in-differences.