

The Prüm Implementation, Evaluation and Strengthening (P.I.E.S.) of Forensic DNA Data Exchange

Northumbria University Final Report

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Executive Summary

Work undertaken by Northumbria University forms a key component of The Prüm Implementation, Evaluation and Strengthening (P.I.E.S.) of Forensic DNA Data Exchange E.C. funded research programme led by the Nationaal Instituut voor Criminalistiek en Criminologie / Institut National de Criminalistique et de Criminologie (NICC/INCC), Belgium since November 2012.

Overall the project sought and has provided knowledge and development of the Prüm directive through a number of integrated strands of enquiry of which the Northumbria University strand reported here is but one. Collectively the project has considered a myriad of important issues such as criminal justice context, development of Member State operational provision, evaluation, scope, policy development and more. Work undertaken at Northumbria University has sought to provide useful and relevant context provision to aid understanding of crime across EU member states and specifically the issue of offending by intra-EU migrants and the potential for the development of crime prevention initiatives and/or policy development.

Activity has been conducted across the 3 years of the project life in 3 high level stages:

- ❖ Significant literature review process seeking to acknowledge and understand the contemporary knowledge base surrounding cross border/transnational crime and identify significant knowledge gaps
- ❖ Development of a transferable analytical model utilising English criminal justice data to provide knowledge on intra-EU offending and seek to fill knowledge gaps identified through the literature review process
- ❖ Exploration of intra-EU migrant offending across Member States and exploration of the transferability of the analytical model

Each stage has been completed and is reported upon within this final report and summarised key findings emanating from the research follow.

Key findings

The Prüm directive stipulates that Information is to be exchanged between authorities "*responsible for the prevention and investigation of criminal offences*", for the purpose of 'crime prevention' and 'investigation'. There is no requirement for this activity to be linked to organised or serious crime but an implied requirement or assumption that one state will seek information from another on the basis that there has been some form of cross border activity in relation to the criminal matter being investigated. Cross border or Transnational offending has received some (limited) exploration in the academic literature and linked with consideration by such agencies as the United Nations but the Prüm directive alters the

concept previously derived. Generally interlinked with organised crime (a contentious term in itself) Transnational/Cross border crime has been seen as an act punishable by law in each of the information exchanging states, and involving the movement of people, objects or decisions across borders with an inherent assumption that movement across borders is required to commit or at least commission the offence. Within Prüm the 'transnational' nature of the offending may now solely be the movement of the offender across state boundaries without any reference to or intent to offend in that journey. No longer is the cross border movement of people in order to offend the required focus, instead the focus widens to encapsulate movement of people across state boundaries who may *subsequently, irrespective of drivers for movement*, commit crime. As such a far more localised concept of cross border crime is developed, that being the localised offending of an individual who has origins in another member state. The potential therefore exists for the Prüm directive to impact on localised crime through detection of offences and informed direction of messages to potential offenders of the existence and operation of the Prüm directive within localities to promote deterrence.

It is suggested that emphasis on this localised aspect should be further developed through substantial spatial analysis of offending and identification of relevant 'localised' areas to inform and develop pro-active use of the Prüm directive outcomes.

Research presented here includes a significant literature searching and review exercise of which this report provides succinct coverage. Academic literature on migrant crime was found to be very limited, contemporary criminological and geography discipline studies tending to focus more on organised crime involving cross border offending activity with limited outputs on offending by non-nationals within an EU Member State. A comprehensive and broad literature search has revealed less than 15 academically published studies with a tentative EU migration and crime emphasis. This lack of established material identified substantial knowledge gaps in terms of the offending by intra-EU migrants within member states and the potential diversity of spatial offending contexts and attributes of offending groups within intra-EU migrant nationalities.

Poor understanding of such context impacts on the ability to provide suitably informed strategies of resourcing criminal justice assets and developing informed crime prevention policies.

Consequently knowledge gaps provided the required drivers to the project of developing a clear understanding of the spatial and human/criminal career attributes of intra-EU migrant offenders. The project objectives sought to develop an analytical model of intra-EU migrant offending transferable across project partner member states to identify the nature and diversity of such offending. Whilst not a signatory to Prüm the UK presented the opportunity to develop a suitable 'pilot' analytical model given the knowledge contained within the research team concerning the type, volume and accessibility of suitably geo-

referenced criminal justice and crime/offending data held by public authorities. Research work therefore followed two distinct avenues namely:

- Development of a transferable, robust and intuitive analytical model of intra-EU migrant offending within England between 2011 and 2013, and
- Exploration of data existence and public availability within project partner member states (and wider) to accommodate the transferability of a UK based analytical model

Spatial examination of intra-EU offending across a 3 year time span utilising differing spatial analytical methods provides useful and relevant information on the spatial diversity (or non-diversity) of these offending groups. Of the spatial analysis methods explored it was the opinion of the research team that the use of Standardised Location Quotients (SLQs), Gini coefficients and Lorenz curves provides an intuitive and visual model of spatial diversity displayed by intra-EU migrant offenders which is readily accessible to practitioners and researchers alike. SLQs also provide flexibility in the subjective decision making of denominator which was found useful following analysis which had established the very poor integrity of population data by nationality, so limiting the creation of offending as a rate of population.

Spatial aspects of offending significantly differ between nationalities; they should not be spatially generalised, highlighting that the exploration of intra-EU migrant crime (and potentially the investigation and justice resource provision within country) by nationality requires spatial context knowledge to generate informed understanding.

Analysis of further data regarding the age and gender of offenders, together with examination of the types of crime committed by intra-EU migrants equally identifies that such factors are diverse across nationalities with statistically significant differences apparent.

Knowledge of the age/crime profiles of such nationality sub sets and the types of crime committed is essential in order to inform resource prioritisation and accurately direct crime prevention messages.

These three key messages of understanding spatial context, age profiles and crime types clearly link with the localised element of 'cross border' crime discussed at the beginning of this section. Crime prevention is a core but often 'hidden' function of all criminal justice work relying on the dissemination of messages in the correct format to impact the correct population sub set. Unless that sub set is accurately defined and understood risk exists to the informed dissemination process, limiting message impact. The Prüm directive and its operation has the potential to impact on the offending decision and that decision will take place irrespective of the crime to be committed – there is no need for crime prevention messages re the Prüm directive to target serious crime only.

It remains imperative that crime prevention message direction is based upon firm knowledge and understanding of the socio/crime profile of the population sub set but that knowledge base currently requires development.

Data was collected on population, nationality of foreigners in the population, counts of crime, counts of foreign offenders charged, and where possible the nationality of the foreign offenders charged. Crime data is not as easily accessible for many EU member states as it is within the UK (19 out of 28 member states could not provide data relating to foreign and native offender at a geographic scale lower than country level).

Analysis of the data pertaining to the calendar year 2012 identified limited availability of data cross the EU member states relating to offending by foreign nationals at a number of different geographic scales. Appendix 4 provides a detailed breakdown of the data availability for each EU member state providing geographic as well as demographic detail.

Overall, data availability (generally crime and nationality populations) from EU15 member states was considered to be relatively poor.

Foreign offending by EU nationals is not high in volume in the EU member states analysed; it makes up approximately 4% of total crime in the Czech Republic, approximately 3% of total crime in Italy, Germany and Denmark, 2.5% in the Netherlands, 1.5% in Slovakia, and less than 1% in England, Austria and Poland. The figures illustrate that the highest foreign offending according to EU nationality varied greatly between these nine countries.

Overall this research has found very limited availability of data within which migration and crime can be explored, utilising publicly available data.

Although it was possible to obtain information and data relating to population and crime for each country at a number of geographic scales, and some were able to provide data on foreign and native offenders/population at scales lower than country level, very limited data was available beyond that. It has become apparent that the public availability of data relating to nationality (or country of origin) of offenders is extremely limited. It is unclear what the underlying reasons behind this are; although we do not feel it is unreasonable to consider that they may be politically driven in nature.

Informed cross-border information exchange between member states is difficult to achieve if information is not collected and made available. We have shown the benefits of analysing data relating to localised offending by foreign nationals in England, and have highlighted some of the problems of utilising openly available data across EU member states.

In order to inform intelligence by national and international police agencies, collective understanding at the EU level is required, rather than simply continuing to focus on developing a national understanding for each EU member state individually in isolation.

Considering the implementation of EU policies enabling the exchange of bio-information, we have tried to provide a more generalised and contextual EU wide picture of intra-EU migrant crime than has previously been carried out. Data on localised offending by foreign nationals can be used to inform intelligence by national and international police agencies, to generate effective cross-border information exchange. However, where such information is not collected and available for analysis within member states, informed knowledge between member states is difficult to achieve. Data is needed upon which requirements for inter-state communication can be built upon for positive investigatory, community safety and crime prevention benefits.

Within this report we identify a number of factors for consideration in relation to Prüm:

- 1) The broad definition of 'crime' which is stated in the EU initiative has the potential to be interpreted to mean 'all' crime, although "*MS may decide to give priority to combating serious crime bearing in mind the limited technical capacities available for transmitting data*". We propose that definition of all crime needs to be reconsidered, to specify more clearly types of crimes which 'should' be included in the treaty. **Consideration needs to be given towards those crimes which have a greater potential to deposit forensic trace material.**
- 2) The data obtained from English police forces has identified positive spatial correlation of intra-EU migrant criminal activity maintained over time, indicating potentially independent geographies of crime. It has not been possible to transfer the model developed in England to any other EU member state, at the same geographic level. Generally, openly available data is of poor quality and very limited in scope for all EU member states. **Data limitations do not allow for the provision of an accurate cross EU picture of the socio-economic and criminogenic factors which affect intra-EU migration, nor does it identify regions which may benefit from a greater Prüm data sharing focus or development of targeted crime prevention messages.**
- 3) Some spatial analysis was carried out across the EU which identified border regions as zones of greater activity for foreign offending, however this data was limited to the categorisations of 'foreign' or 'native' and did not provide a breakdown of nationality. Consequently it was not possible to determine whether it was EU or non EU-nationals who were offending in border regions. However, this increased border activity does relate to work carried out by other project partners (Bernasco et al.) who utilised the Prüm Treaty to develop a cartography of DNA hits between the Netherlands and the EU, establishing transnational spatial patterns of offending predominantly indicating high rates of activities in border regions. This may provide important intelligence for regional police forces to focus resources on the collection of body fluids at crime scenes to improve potential Prüm hits.

- 4) Data from England identified five nationalities of specific interest – Poland, Lithuania, Latvia, Portugal and Romania – using a number of statistical techniques. Italy and Eire were also found to significant for 2011 and 2012-2013 respectively, but were not consistently significant across all three years (the other five were). The identification of these outlier nationalities in England, provided areas of further analysis which has the potential to impact police policy, crime prevention and intelligence strategies. Again, the prevalence and importance of these nationalities could not be repeated at EU level and is not available to inform EU policy and policing. However, it is anticipated that similar geographic and nationality disparity would be evidence in other EU member states.
- 5) Further analysis of English data also considered age, gender and crime types committed by foreign nationals, and it quickly became evident that differences exist. Of particular importance to Prüm is the difference in crime types committed by EU nationals: A8 and A2 nationals predominantly commit acquisitive offences (e.g. theft) and very little violent offences. The likelihood of obtaining forensic trace material (particularly DNA) from acquisitive crimes is low. Consequently, Prüm may not be the most effective means of identifying intra-EU offenders originating from A8 or A2 member states.
- 6) Overall, there is significant data uncertainty when trying to paint a macro cross-member state picture of the intra-EU migration and crime issue, providing limited knowledge generation opportunities without multi-disciplinary cooperation on an international level. The cross-boundary sharing of information ought to be based on robust, accurate and detailed data, which is currently unavailable for a number of reasons. This does not provide a strong basis on which to expand data sharing and interrogation.

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Abbreviations

CEE – Central & Eastern European
FOIA – Freedom of Information Act
LQ – Location Quotient
ISTAT – Italian National Institute of Statistics (Istituto nazionale di statistica)
NUTS – Nomenclature of Territorial Units for Statistics
MAD – Median and Absolute Deviation
SOCTA – Serious Organised Crime Threat Assessment
TOC – Transnational Organised Crime
UNODC – United Nations Office on Drugs and Crime

Member state classification

EU15 – Austria, Belgium, Denmark, Spain, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Sweden, United Kingdom,
A10 – Cyprus, Malta + A8 Member States
A8 – Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia
A2 – Bulgaria, Romania

EU Member State Abbreviations

AT – Austria	FR – France	MT – Malta
BE – Belgium	GB – United Kingdom	NL – Netherlands
BG – Bulgaria	GR – Greece	PO – Poland
CY – Cyprus	HU – Hungary	PT – Portugal
CZ – Czech Republic	HR – Croatia	RO – Romania
DE – Germany	IE – Ireland	SE – Sweden
DK – Denmark	IT – Italy	SK – Slovakia
EE – Estonia	LU – Luxembourg	SI – Slovenia
ES – Spain	LV – Latvia	
FI – Finland	LT – Lithuania	

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Project Outputs

Presentations

1. McCloskey, M. & Johnson, D. (2013). Transnational offending in the UK. Presented at *Northumbria University Law School PIES Workshop - 2nd July*. Newcastle upon Tyne.
2. McCloskey, M. (2014). Freedom of Information Act data collection; developing positive outcomes through considered use. Presented at *Northumbria University Research Conference - 21-22nd May*. Newcastle upon Tyne.
3. Johnson, D. (2014). E.U. Migrant Criminal Activity: Exploring Spatial Diversity and Volume of Criminal Activity Attributed to Inter EU Migrants in England. Presented at *Northumbria University Research Conference – 21-22nd May*. Newcastle upon Tyne.
4. Ludwig, A. (2014). The Prüm Implementation, Evaluation and Strengthening of Forensic DNA Data Exchange (Poster). Presented at *Northumbria University Research Conference - 21-22nd May*. Newcastle upon Tyne.
5. Johnson, D. (2014). Inter EU migration: Spatial diversity and crime impact across English Police Forces. Presented at *Prüm Implementation, Evaluation and Strengthening of Forensic DNA Data Exchange (PIES) Workshop, 25-26th June*. Brussels.
6. Ludwig, A. (2014). EU migration and crime. Presented at *Prüm Implementation, Evaluation and Strengthening of Forensic DNA Data Exchange (PIES) Workshop, 25-26th June*. Brussels.
7. Ludwig, A. (2015). Crime and migration in a borderless Europe. Presented at *Policing in times of uncertainty: challenges of integrated security - 1st May*. Abertay University, Dundee.
8. Johnson, D. (2015). Examining the spatial distribution of EU migrant criminal activity. Presented at *Policing in times of uncertainty: challenges of integrated security - 1st May*. Abertay University, Dundee.
9. Johnson, D. (2015). 'Intra-EU migrant crime: Fact, fiction and knowledge gaps' Conference panel at *The Stockholm Criminology Symposium – 8-10th June*. Stockholm, Sweden.
10. Johnson, D. (2015). Seeking informed policy on intra-EU: What we do, what we don't and what we need to know. Presented at *The Stockholm Criminology Symposium – 8-10th June*. Stockholm, Sweden.

Papers

1. Johnson, D. (2014). E.U. migrant criminal activity: Exploring spatial diversity and volume of criminal activity attributed to inter EU migrants in England. *Applied Geography* 50:48-62.
2. Johnson, D. (2015). Mapping the Geography of Intra E.U. Migrant Criminal Activity in England: Spatial Disparity and Spatial Trends Over Time in the Offending Attributed to Intra EU Migration – pending peer review
3. Ludwig, A. & Johnson, D. (2015). Intra-EU Migration and Crime: A Jigsaw to be reckoned with. *Tijdschrift voor Economische en Sociale Geografie*. Under review.

4. Ludwig, A. & Johnson, D. (2015). Migration and crime: a spatial analysis in a borderless Europe. *European Journal of Policing Studies: Special issue* Under review.
5. Johnson, D. & Hampson, T. (2015) Utilising the UK Freedom of Information Act 2000 for crime record data: Indications of the strength of records management in day to day police business. *Journal of Records Management* – accepted.
6. Ludwig, A. & McCloskey, M. (2015). Using crime data in academic research: issues of comparability and integrity. *Journal of Records Management* – accepted.

Introduction

The core of the P.I.E.S. project lies in the development of the operational status of directives laid down in the EU through the Prüm decision, namely the safe and timely exchange of bio-informatic data between states. Alongside the tasks of partners in this operational development Northumbria University has sought to provide context to the operational aspects through examination of the criminogenic background and the Prüm decision in terms of its relationship with harmful activity. Cross border crime is the driver for the original convention of 2005 and as the Council of the EU deals with and in a legalistic framework, the term 'crime' is quite clearly reflective of an activity that is unlawful by means of legislation, and would seem to follow the expected typical dictionary definition. Cross border crime would therefore appear to relate to criminal acts which in some way straddle state borders, however there is no section within the 2005 Convention or the subsequently adopted Act of 2008 and Technical Provisions that deals with the definition of these terms.

It becomes necessary to consider the term cross-border in some further detail, if for no other reason than to inform the research activity to be undertaken and set suitable parameters within which the research can be contained and directed. Contemporary criminology and associated literature pays little attention to formally defining terms of 'transnational' or 'cross-border'. Almost all research dealing with any level of the globalisation of crime is firmly focused on the concept of organised crime in its many suggested forms.

This report will begin with a provision of the definitions of the terms 'transnational crime' and 'organised crime' before setting out Northumbria Universities' aims and objectives.

Defining transnational crime

The United Nations adopted the Convention against Transnational Organised Crime (2003) to "*promote cooperation to prevent and combat transnational organized crime more effectively*" (Article 1). Whilst again being primarily focused on organised crime, for which the convention lays down formal definitions, the concept of transnational crime is examined and defined as:

An offence is transnational in nature if:

- (a) It is committed in more than one State;
- (b) It is committed in one State but a substantial part of its preparation, planning, direction or control takes place in another State;

- (c) It is committed in one State but involves an organized criminal group that engages in criminal activities in more than one State; or
- (d) It is committed in one State but has substantial effects in another State (Article 3).

The Convention also defines 'serious' crime in section (b) of Article 2, as it considers the undertaking of serious crime to be a constituent part of the act of an organised crime group within the meaning of the convention. In this case serious crime is defined as:

- (b) 'Serious crime' shall mean conduct constituting an offence punishable by a maximum deprivation of liberty of at least four years or a more serious penalty.

A definition that may become relevant with the Prüm Convention aligning the commission of serious crime with certain criminal justice resource provision.

Within the Prüm Convention information is to be exchanged between authorities which are "*responsible for the prevention and investigation of criminal offences*" (Article 1), with no formal definition of why those authorities should exchange information other than for the purpose of 'crime prevention' and 'investigation'. There is therefore no requirement for this activity to be linked to organised crime (however one may define that concept) but an implied requirement or assumption that one state will seek information from another on the basis that there has been some form of cross border activity in relation to the criminal matter being investigated.

Albanese (2012) has proposed a classification of transnational crimes, consisting of three types of crime: provision of illicit goods, provision of illicit services and infiltration of business or government [1]. Further to this classification, he contends that by nature, most of these crimes require more than one person to be involved, therefore all transnational crime can be seen as a form of organised crime.

Coupled with the typical definition of crime as 'an act punishable by law' we can consider transnational crime for the purposes of this project as requiring:

- (a) an act punishable by law in each of the information exchanging states, and
- (b) involving the movement of people, objects or decisions across borders

The existing literature on transnational crime focuses heavily on organised crime [2], and drug and human trafficking in particular [3]. Also involving cross-border movement, and suggested to have increased since EU enlargement, is organised acquisitive crime with vehicles stolen for shipment overseas a continuing problem for the UK. Despite the focus on organised crime, it has been reported that the nature of offending by foreign nationals is mainly low level such as minor disorder and shoplifting [4]. The rate of involvement in

serious crime by foreign nationals was similar to that of UK nationals, although some involvement in transnational organised crime is also apparent.

There has been much focus on the lack of a single agreed definition of 'organised crime' [5-7]. It has been described as a 'contested concept' [6] and an ambiguous term [8]. 'Transnational Organised Crime' (TOC) is therefore also ambiguous [3], and has been criticised by scholars, who highlight in particular the error of welding two undefined terms together. It is unclear from the literature whether the use of the term refers to crossing of borders by criminals, criminal activities, networks, organisations or power [3].

Criminological literature and Governmental publications have attempted to identify structural characteristics thought to be important in organised crime [6].

“Organized crime’ is understood to be the large-scale and complex criminal activity carried on by groups of persons, however loosely or tightly organized, for the enrichment of those participating and at the expense of the community and its members. It is frequently accomplished through ruthless disregard of any law, including offences against the person, and frequently in connexion with political corruption” [9].

Madsen (2009) considers the 'most authoritative definition' of organised crime to be that of the 2000 United Nations Convention against Transnational Organised Crime (TOC) which defines it as a: *“structured group of three or more persons, existing for a period of time and acting in concert with the aim of committing one or more serious crimes or offences in order to obtain, directly or indirectly, financial or other material benefit”*. However, this definition too has been subject to criticism, and deemed 'too broad' [10].

TOC can be the result of offenders operating internationally, in pursuit of the most rewarding targets and markets. Or it could be locally operating offenders cooperating with others, where it is the networking that crosses borders rather than the offenders [11].

This problem of defining organized crime is unlikely to be resolved, since it is an entity that is diffuse and changing [5]. The United Nations declare they have deliberately not published a concise definition of transnational organised crime in recognition that new types of crime emerge constantly as conditions change over time [12].

The problem of organised crime has risen on the agenda of the EU and its member states and increasingly been seen as a serious threat [2, 8, 10, 13]. It is acknowledged that there is a lack of data and literature available regarding the nature and extent of organised crime [8], and that attempts to model or estimate the situation would be flawed due to the shortage of comparable data. The existence of transnational organised crime at all has been questioned [14]. The prominence of organised crime when discussing transnational crime has been criticised, with arguments that the impacts of organised crime are experienced

locally, within territories, not transnationally [13]. Hobbs (1998) has questioned whether organised crime is as great a threat as some organisations portray it to be [14].

The EU's Serious and Organised Crime Threat Assessment (SOCTA) gives the crime types seen as a problem Europe-wide: drugs, illegal immigration, trafficking in human beings, fraud, cigarette smuggling, counterfeiting, weapons trafficking, organised property crime, environmental crime, money laundering, and cybercrime [15]. The focus of the literature varies, with some placing emphasis on the criminal activity, some on the 'organised' nature of it, and some on the networks or organisations.

Von Lampe (2009) proposed five types of criminal organisation [11, 16]. Of particular relevance is the type of organisation he calls "*networks with no social support structure*"; referring to foreign-based criminal groups without a support structure within the country they are offending in. He suggests that this type of group enter countries to engage in "*crime tourism*" [5].

The Europol Drug Markets Analysis [17] reported that the main trafficking route for heroin into the EU is the 'Balkan route', from Afghanistan, through Iran and Turkey, into Eastern European countries such as Albania, Romania and Bulgaria. From these Balkan countries the heroin is transported onto Western and Northern Europe, with the Netherlands and Belgium in particular acting as distribution centres for heroin to the rest of Western Europe.

The report highlights the important route of cocaine, from South America into the EU via Spain and Portugal, from where it is distributed to Western Europe, with France having high transit of cocaine [17]. The report also draws attention to a recent trend of cocaine arriving in Europe at Black Sea ports in Bulgaria, Romania, Greece and Ukraine, with Albania used as a storage country, and the emergence of Baltic Sea countries in cocaine trafficking. Analysis of cocaine price data in has provided evidence of the flow of cocaine; showing that from arrival in Spain and Portugal, it tends to move eastwards through Europe, with the cost increasing as it moves further from the source [18].

It was noted in the Europol report, that herbal cannabis is increasingly being grown in countries throughout the EU for domestic use, while the production of cannabis resin continues to be mainly in Morocco then smuggled into Europe through Spain and Portugal. Dutch criminal groups are believed to play an important role in the production of cannabis, following increased law enforcement in the Netherlands they are increasingly operating also in Germany, Belgium and other West European countries. The Netherlands and Belgium are described as important distribution centres for heroin, cocaine and cannabis. The Netherlands is also reported to be the main production centre for synthetic drugs for European distribution [8, 17]. There is thought to be a 'growing trend for producing close to destination' [17].

Literature on drug trafficking has suggested that criminal groups who traffic drugs may also traffic arms [19] or humans [20]. It is thought that the infrastructure for trafficking is similar or shared. It is also proposed that drug markets are saturated, leading criminal groups to diversify [20].

The trafficking of humans is the third largest illegal trade globally [21], and has recently attracted increasing political concern [22]. However, there has been ambiguity between human smuggling and human trafficking, and also illegal immigration, with the terms being used interchangeably in some cases, although they are different, albeit linked, issues.

The UN protocol to prevent trafficking [23] defines trafficking as “*the recruitment, transportation, transfer, harbouring or receipt of persons*”, using force, threat, coercion, abduction, deception or abuse of power, “*for the purpose of exploitation*”. This definition allows for any of the actions along the chain to be classed as trafficking [24]. However the definition has been criticised for focusing on the movement of victims and not on the exploitation that follows, leading to law enforcement therefore tending to focus on disrupting the movement rather than the exploitation or enforced labour practices in destination countries. Smuggling is defined as the “*illegal movement of persons across borders in order to obtain some form of benefit*”, with the migrants’ consent implied [22]. Migrants choosing to be smuggled may be driven to it by conditions such as war and poverty.

Data relating to human trafficking is difficult to obtain due its hidden nature, therefore estimates of the extent are vague [24]. Those who commit human trafficking are considered to be professional and organised criminals, who adapt their operations according to the existing markets [22]. However it has been suggested that there is a lack of evidence to support conceptualising this trafficking in an organised crime context [22].

Organised crime groups may be small and involved in one stage of the trafficking process, or more powerful and in control of the whole process, with cells operating in more than one country [15]. There is an increasing tendency for organised crime groups to cooperate with groups of different nationalities, in the process of human trafficking [15].

It has been suggested that it is not only criminal organisations involved but that overtly legitimate agencies may be involved, either knowingly or unknowingly, for example providing tourist visas for the entry of victims, arranging transport, or arranging employment [25]. While 71% of victims are trafficked for the purpose of sexual exploitation [12], there is also a demand for forced labour in the fields of construction, agriculture, service, manufacturing and domestic work [15].

The Prüm Decision and subsequently developed processes set a secondary use of the terms discussed. A DNA crime scene profile from one member state may be (and often is) used to identify a single person for a serious criminal act by comparison with a database held in

another member state. As a result the ‘transnational’ nature of the offending in question may solely be the movement of the offender across state boundaries without any reference to or intent to offend in that journey. No longer is the cross border movement of people (individuals or otherwise) in order to offend the required focus, instead the focus widens to encapsulate movement of people across state boundaries who may subsequently, *irrespective of drivers for movement*, commit crime.

Strategic contextual content

The Prüm Decision provides for the automated exchange of DNA, fingerprints and vehicle registration data, as well as for other forms of police cooperation between all the member states aligned to the decision (does not include the U.K. at this time). Major technical, procedural legal and strategic questions must be resolved before DNA data can be used effectively, economically and in a timely manner to fight transnational crime under the Prüm Council Decisions. Technical implementation still poses major problems for some states and diverse national legal procedures and organisational structures can impede or delay follow-up action after a DNA match has been achieved. Access to DNA profiles and fingerprints held in national databases is granted on a ‘hit/no-hit’ basis, which means that DNA profiles or fingerprints found at a crime scene in one EU State can be compared with profiles held in the databases of other EU States. Figure 1 depicts the countries currently exchanging DNA data under the Prüm Convention.

Several strategic questions are posed regarding how to maximize the benefit of exchanging forensic bioinformation – fingerprints as well as DNA – in compliance with EU and member state legal and ethical norms. The role of Northumbria University academics within the wider PIES project is within the fourth strand of research activity: the ‘Strategic analysis of the benefit of the Prüm DNA exchange’. To gain an understanding of the social, economic and political drivers of transnational crime and the movement of offenders across state boundaries in order to inform the development of potential crime prevention, reduction and detection methodologies [26].

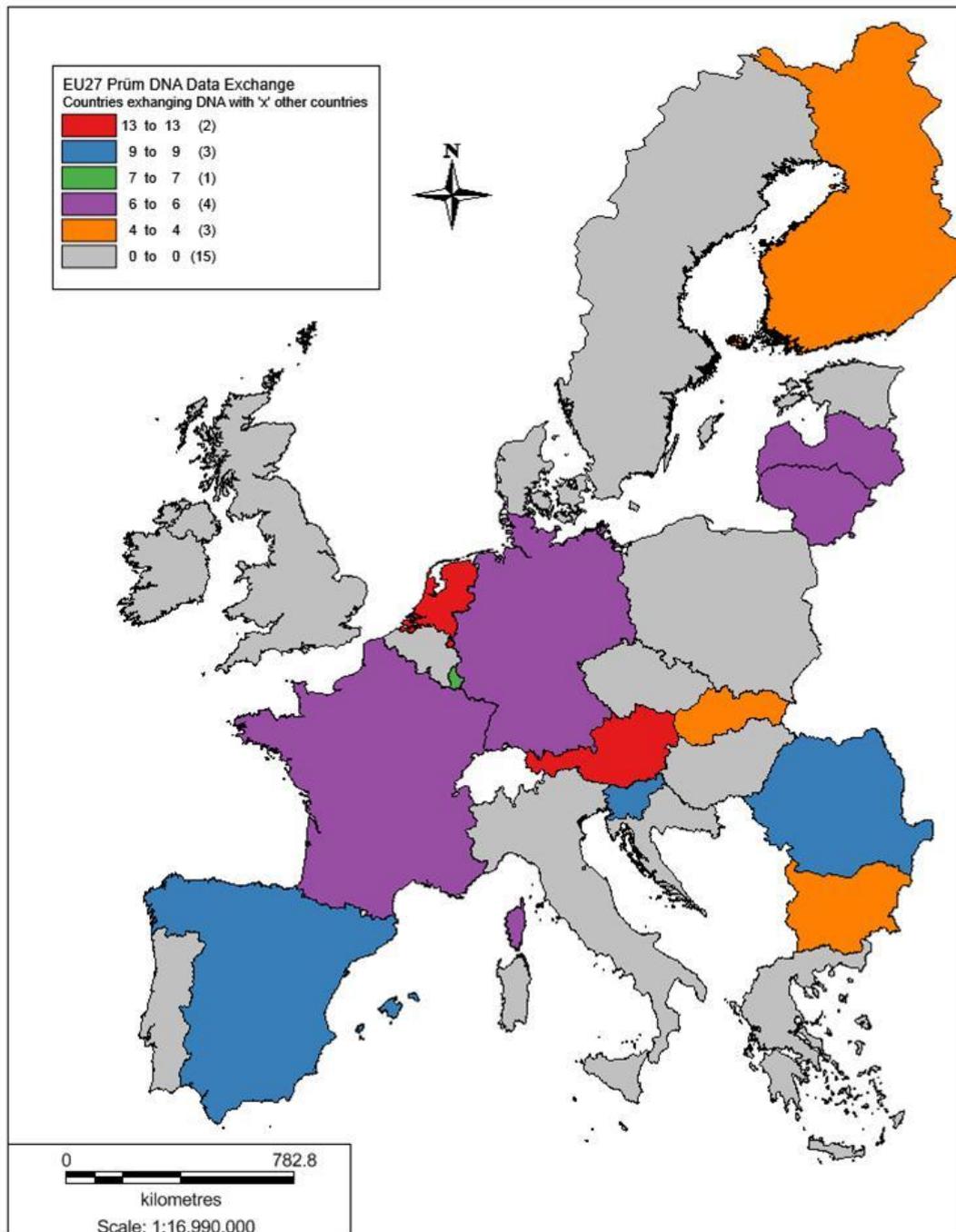


Figure 1: Prüm DNA Data exchanges between EU member states (July 2012). Data source (E.C. Report 2013).

Literature Review

Migration is a complex and diverse field of interdisciplinary enquiry spanning a variety of scales of examination and impact (e.g. global, regional, international, national, local). Human migration has been explored for decades and, recent, advances in genetic technology have turned it into a truly global scale of enquiry tracing the histories of the movement of people [27].

Rystad (1992) recognised that migration must be considered as a permanent rather than temporary phenomenon [28]. He introduced the concept of ‘intra-regional’ migration (migration within a limited geographical area, e.g. from less developed to better developed countries and regions), suggesting a shift away from ‘transcontinental’ migration, the more dominant concept at the time [28]. Due to the significant instability which existed within the USSR (as it was then known) and many eastern European countries at the time of his writing, predictions of future intra-regional migration from eastern to western Europe were already apparent, contrasting the trend of existing intercontinental migratory patterns [28].

It was during this time that the EU and the Schengen agreement seeking border free movement for member populations had been developed but not yet enacted. Intra-regional migration within Europe was not new, the Second World War had hit all countries hard and there was a need to rebuild labour markets using targeted immigration and the relaxation of immigration rules was a tactic employed by many Western European countries. EU expansion and constantly improving technology impacting travel and communication stretched the parameters beyond any model and scale previously considered. By the mid-1990s inter-country travel was fast, cheap and reliable; communication was similarly expanding by booming technological advances.

It was during the late 1980s/early 1990s that cross-border crime became an issue of EU focus, although it had first been discussed a decade before. In 1995, Solomon identified a significant growing problem of organised crime within the EU, which he suggested would lead to *“the demise of the Union in economic and global markets”* [29] unless a unified force was developed to tackle it; an issue receiving attention at that time through the development of Europol, the European Union’s law enforcement agency.

The increase in global travel and legitimate trading (of services, commodities and products) has affected and created opportunities for illegal activities and movement of people for legitimate and illegitimate purposes apparent within Europe due to free and unrestricted movement within and between EU member states [30, 31].

Growing from 6 to 28 member states over 40 years, table 1 maps the expansion of the EU, providing a timeline of development, labelling of accession waves and the introduction of free movement caveats [31]. This timeline illustrates that the notion of the ‘freedom of movement’ becomes somewhat devolved from 2004 due to the restrictions implemented

on Central & East European (CEE) countries by postponing the opening of the labour markets and limiting access to welfare benefits for a maximum of seven years. Accession rules have been fully examined over the years [32-37], the impact of migration flows appears to have been dependent, at least to some degree, upon restriction rules set by receiving member states [38-40].

Estimations of migration flows from the A8 accession countries differed from the expected [38] as many projections were benchmarked against free, unrestricted movement of labour across all EU member states which ultimately did not materialise. This mixed application of accession restrictions diverted “*migration flows away from countries which pursued a restrictive immigration policy*” to countries with no such implementation or fewer restrictions [32].

Table 1: Timeline of the enlargement of the EU

Original member states	EU Enlargements							
	1973	1981	1986	1995	2004	2004	2007	2013
Belgium France Germany Italy Luxembourg Netherlands	Denmark Ireland UK	Greece	Portugal Spain	Austria Finland Sweden	Czech Republic Estonia Hungary Latvia Lithuania Poland Slovakia Slovenia	Cyprus Malta	Bulgaria Romania	Croatia
Label: EU15					Label: A8 ¹		Label: A2 ²	
Label: (Collectively) A10								

¹ All but the UK, Ireland & Sweden imposed various interim restrictions on A8 nationals protecting internal labour and economic markets.

² Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Poland, Slovenia and Slovakia allowed the A2 unrestricted access. Majority imposed interim labour market/welfare restrictions. Spain initially allowed unrestricted access. In July 2011 it introduced restrictions for Romanian workers until the end of 2012, Italy lifted restrictions in January 2012.

Traditional patterns of migration within the EU were generally South to North, with the Mediterranean countries such as Italy, Greece, Spain and Portugal being countries of emigration [41] and migrants moving to the North and West. Migration trends have changed more recently and since 2004 the shape of intra-EU migration patterns has generally been from East to West [42, 43]. The countries receiving the largest numbers of intra- EU immigrants have been Germany, Spain, Italy and the UK [44, 45]. These patterns suggest that some countries which have traditionally had high emigration such as Spain and Italy, have recently attracted large amounts of immigration from newer EU member states [45].

The UK has been the most common destination of A8 migrants [46] although It has been suggested that the UK's decision not to impose controls on A8 migrants was significant [47]. It has also been argued by a UK Think Tank that in considering migration the Government and others have tended to focus only on numbers of migrants, with policy aimed at reducing net migration numbers⁴⁸, ignoring the complex drivers behind decisions to migrate [48].

Migration from some countries has now slowed from the rate seen in the wake of EU enlargement. In 2011, high return migration was reported in Lithuania, Portugal, Croatia, Estonia and Greece [45]. Despite this, there was more emigration than immigration reported by Bulgaria, the Czech Republic, Ireland, Greece, Spain, Poland, Romania, Latvia, Lithuania and Estonia.

A lesser explored pattern of migration is that of wealthy migrants from Northern Europe to the Mediterranean area, particularly Spain [49]. Much of the literature on migration has been concerned with the migration of people from poor countries to countries perceived as more affluent [50]. Little attention has been paid to the movement of wealthy people, who are able to travel freely between countries, or to the migration from Northern Europe to Spain, by both the wealthy and the working class. As a consequence of tourism, large numbers of Northern Europeans, particularly from Germany and the UK, have moved to the Mediterranean area, either intending to work or to retire [51]. Factors such as the climate and the perceived better value for money, cheaper property and better quality of life have influenced decision to migrate [52], although the global financial crisis from 2008 is likely to have impacted this perception by some. This pattern of migration is also favoured by criminal entrepreneurs, who choose to conduct their illicit businesses from Spanish coastal areas, where they are relatively unknown to local authorities [49].

Migration has traditionally been seen as a one time, permanent move to a new country [52, 53]. Increasingly, new types of spatial mobility are emerging with moves seen as less permanent, and the distinction between migration and tourism has become blurred. In particular, a substantial (but unknown) proportion of the migration of young workers from Eastern to Western Europe following the EU enlargement has been circular, with many returning home after some time [30]. In the case of migration to Spain or other

Mediterranean resorts, that migration is often not a permanent move but a seasonal or a temporary one [51].

Drivers of migration

In 2004 ten new countries joined the EU, of which eight were in Central and Eastern Europe and labelled the A8 countries. This enlargement essentially increased the population of the EU by 75 million in one go [54]. At the time, these countries had emerged from Communist rule with very different political and social cultures to the existing 15 EU member states. Suddenly, citizens became 'free' to move to other member states, as well as within their own. After years of mobility being restricted by Communist rule, citizens of the A8 countries were granted freedom of movement [43], the core of EU citizenship [30, 55].

The accession of the eight CEE countries in 2004 saw the largest income difference between the incumbent EU15 member countries and new member states [32], an important driver for migration [56] given the great disparity in wages between West and East Europe [57, 58]. Warnings about job seekers and 'welfare scroungers' added to the already anxious British population about the impact of globalisation and seemed to justify fears of mass migration if free movement of labour was permitted [56]. The largest migrations have occurred from the poorest economies of the new member states, which also tend to have higher unemployment rates [59]. The average wage in Latvia, the poorest A8 country, was just one-eighth of the EU15 average in 2003. However, the wage gap between many A8 countries and the EU average has been drastically reduced but still remains substantial. The *"rapid convergence"* of wages resulted from the *"combined effect of high wage dynamics in A8 countries and the appreciation of their national currencies against the euro"* [56].

Migration behaviour is commonly characterised in terms of a push-pull approach, which consists of factors which attract immigration and factors that stimulate emigration [60]. The former are pull factors determining the choice of the destination country, whilst push factors determine the decision to emigrate. Push and pull factors include income levels and employment opportunities with significant income gaps between new and old members being a cause of concern for some EU15 governments, potentially leading to an excessive influx of workers.

It has been shown that shared characteristics between countries such as language or cultural affinity are important in migrants' choice of destination [61]. Migration for study tends to be temporary, although some may choose to stay on after completing their studies. Some migrants, particularly of the new wave of young EU citizens with the right to free mobility, move as a lifestyle choice [30, 62].

Concerns about whether immigrants may depress wages, cause unemployment, exploit social security systems, and generate social tensions have been contrasted with scientific emphasis on the economic need for skilled workers by native firms and the creative potential immigrants may possess. In general, the economic impact of immigration on receiving labour markets depends on the scale of immigration flows, composition of the migrating population, and the functioning of the receiving economy [58].

Studies of the economic impact of immigration in general conclude that while it has a positive impact on the public finances, it decreases wages and the employment prospects for certain groups, in particular the low skilled [63]. Intra-EU mobility might be thought to have a greater negative impact, because governments are unable to control the skill level of inflows into a particular area, meaning there is a greater risk of an influx of workers competing for low-skilled jobs. The few studies that disaggregate intra-EU mobility from immigration more broadly find no evidence that this has occurred [64].

Western European countries are considered by some to have reaped economic benefits [43], gaining hard-working, relatively cheap labour to fill jobs deemed unacceptable by many of the host country's population. While powerful Western European countries have gained a workforce, including many who are highly educated or skilled, the countries they have left behind have been considered by some to have suffered "*brain drain*", losing a large proportion of their most educated young people [62, 65]. The employment of these qualified migrants is usually in jobs at a lower level than their skills and education reflects, often referred to as dirty, dangerous or dull jobs [66]. This tendency to accept jobs at a lower level than would probably have been aspired to at home is seen by some as a waste of talents, or "*brain waste*" [62].

Within Europe, female migrants from the Eastern European accession countries have also been affected by deskilling – the bulk of migrants since 2004 have filled low skilled jobs in old EU countries [67]. Academic research and policy studies of migrant women's employment usually focus on those who enter the highly feminised and lesser skilled reproductive sectors of the labour market, such as sex work [68, 69], domestic work [70], and more recently care work [71]. Female migrants have often entered Europe as part of family re-unification schemes.

While the economic impact of EU migration has been broadly positive, social impacts are very difficult to measure, it being difficult to disaggregate intra-EU migration from other forms. Communities suffer when the pace of change applies pressure on local infrastructure, but many of the problems faced by mobile EU citizens following the recession were shared by other groups [64]. Migrations can be spectacular or mundane, or regarded as problematic or non-problematic. By and large, the mundane, unproblematic forms of movement are left unrecorded and often unstudied. The spectacular, problematic ones

receive all the attention, although here it must be stressed that the nature of the ‘spectacle’ is often exaggerated and distorted by its media portrayal and politicisation [72].

Despite the economic depression which has affected most of Europe over recent years, Eurostat data indicates that in 2011 approximately 3 million migrated to one of the 28 EU member states [73], of which approximately 1.3 million immigrated within EU member states [74]. There were also an estimated 20.7 million non-EU nationals residing in the EU (4.1% of the EU28 population) [75].

Labour mobility from the A8 to the EU15 has decreased since 2008. This trend can be attributed to a reduction of the migration potential of those countries, due to improved labour market conditions in some origin countries, and to the economic crisis affecting the main receiving countries among the EU25, with the consequent decline in labour demand [40].

Even before their accession into the EU, Spain and Italy received a large number of immigrants from Romania and Bulgaria. This was further facilitated by continued bilateral agreements and specific legislations and large regularisation held in Italy in 2002, and Spain in 2005 which allowed “many *illegally employed Romanian workers to appear in the statistics of work permits*” [40]. Spain appears to be the main destination country for A2 migrants, followed by Germany, the UK and Austria [33]. Common linguistic roots and high labour demand – both formal and informal – in specific sectors such as construction and domestic and elderly care, together with the favourable regulatory framework foreseen in bilateral agreements, have been the main drivers for A2 workers’ inflows into Spain and Italy. The large increase in those inflows constituted an important pull factor for Romanian and Bulgarian workers into Italy and Spain, at a time when their opportunities for legal immigration for employment were largely restricted [40].

Who is a migrant

The classification and counting of nationals and foreign nationals is commonplace across Europe [76] but not necessarily displaying common practice. Nationality is often regarded as the most appropriate means of measuring international mobility. The categorisation of the ethnic status in official statistics tends to follow two traditions. In most southern European countries, the distinction is based on nationality (the national and the foreigner (EU and the non-EU)) [77]. Northern European countries classify migrants relating to their ethnic or origin background. For example, the UK uses a system of self-identification for ethnicity, the Netherlands categorise its population according to the country of birth of the parents and the individual (regardless of whether they hold Dutch nationality or not) [77]. Belgium is divided between the French and the Dutch speaking sectors; the French speaking part follows France in refusing ethnic categorisation, whereas the Dutch speaking part

distinguish between ‘allochtones’ and ‘autochtones’, where allochtones is used to refer to immigrant-origin (non EU) inhabitants [77]. Except for some prison statistics, official data in France distinguish only between French citizens and “foreigners” and does not make distinctions based on “race” or “ethnic group”. This is true of administrative statistics and of studies and surveys in the social sciences [78].

Delineation between nationalities within data categories therefore becomes problematic for the researcher and presents risk in terms of the integrity of migration/population information to inform high level policy. Within England it has been highlighted that poor delineation of nationality with the 2011 national census population survey impacts on the derivation of suitable contextual rates of intra-EU migrant offending to the extent of rendering such context provision unusable (146).

Mobility of criminals

The increasingly mobile nature of crime in Europe has been facilitated by several factors. It is generally agreed that the opening of borders under the Schengen agreement has contributed to cross-border crime [11, 79-82]. This new ease of travel across borders has both increased legitimate cross-border routine activities, and reduced the obstacles to transnational offending. The increased permeability of borders has caused Eastern European criminal organisations in particular, to rapidly expand their operations across Europe [83]. Criminal enterprises have developed internationally to exploit differences in different legal systems [83]. The establishment of a single market and increased cross-border trade has brought more individuals and organisations into contact with those in other countries [83]. The increasing sophistication of criminal entrepreneurs, along with developments in communication technologies have also made a significant contribution [13, 83].

Since the late 1990s, Belgian law enforcement identified an increasing number of offenders engaging in property crimes, with a high level of mobility [84]. These groups were labelled ‘itinerant crime groups’, and after a number of years of fine-tuning the phenomenon, it was defined and recorded in Belgian criminal policy. Key features of these groups are: systematic offending, offending in groups, groups involving individuals from Eastern European origin and operating from Belgian cities or abroad [85, 86].

Investigating itinerant crime groups, Daele and Beken (2010) identified Eastern European offenders as a separate group (the others being: ‘Belgian’ nationality and ‘other’ nationalities) [87]. They included nationals from what used to be the Eastern Bloc, including the former Soviet republics and the Soviet satellite states, but also including the countries that were covered by the Federal Republic of Yugoslavia and Albania [88]. They found that more than 60% of offences committed by Belgian offenders were committed less than 10km

(6.2 miles) from home. However, only 32% of Eastern European offenders committed offences close to home. The distance travelled by Eastern European offenders was found to be nearly double that of other offenders [88].

Ponsaers (2004) estimated that these groups were responsible for about 25% of all property crimes in Belgium [89]. Organised property crime committed by these groups has been raising concern not only in Belgium, but also in some of its neighbouring countries, under a variety of names ('mobile banditism' in the Netherlands [90], 'itinerant crime' in France and 'Eastern European criminal groups' in Germany [91]).

Migration and crime

There has been political and media interest in the relationship between migration and crime [92]. The question of whether migrants commit more crimes than natives has been explored to some degree in literature, but there has been little empirical research to date. In countries hosting large numbers of immigrants, crime has been blamed on foreigners (in general, not just EU immigrants) for many years [93, 94]. In some foreign nationals have been blamed for increasing crime rates by the media, who have sensationalised stories of foreign criminals, and in some cases have driven calls for restricting immigration or deporting foreign criminals [95].

A number of studies have looked at the link between immigration and crime with varying degrees of success. Many of these studies focus on specific aspects; some compared rates of immigration and crime [96-98], others looked at crime rates by native and non-native offenders [78, 99, 100], or investigated foreigners as a percentage of the prison population [93, 101, 102]. A comprehensive and broad literature search has revealed less than 15 academically published studies with a tentative EU migration and crime emphasis (see table 2).

Solivetti (2012) found that although the immigrants share in crime figures varies by country, on average immigrant crime rates are two to four times higher than the rest of society [93]. He also states that, in contrast, in the US, Canada and Australia immigrant crime rates are similar to that of the native population [93]. This difference supports the argument that immigrant crime is not directly caused by immigration alone.

Table 2: Overview of the empirical studies that have investigated EU migration and crime

Focus of study	Countries included	Sources	Author(s)
Immigration rates vs crime rates	Germany		Chapin (1997) [96]
	Italy	The National Institute for Statistics (ISTAT)	Bianchi et al. (2008) [98]
	France	Institut National de la Statistique et des Études Économiques (INSEE), Institut National d'Études Démographiques (INED), Ministère de la Santé et des Solidarités	Aoki & Todo (2009) [103]
	England	Office of National Statistics (ONS), Worker Registration Scheme (WRS), National Asylum Support Service (NASS)	Bell & Machin (2011) [97]
	EU15		Solivetti (2010) [55]
	Italy	The National Institute for Statistics (ISTAT)	Bianchi et al. (2012) [104]
Crime by natives vs non-natives	France	Institut National de la Statistique et des Études Économiques (INSEE), Institut National d'Études Démographiques (INED), Ministère de la Santé et des Solidarités	Tournier (1997) [78]
	Germany & Denmark	Polizeiliche Kriminalstatistik (PKS)	Entorf & Larsen (2004) [99]
	Italy	The National Institute for Statistics (ISTAT)	Crocitti (2014) [105]
	England (London only)	Census, Annual Population Survey (APS), Data.gov.uk	Jaitman & Machin (2013) [100]
Foreigners as percentage in prison populations	USA, Australia, UK, Canada, Japan, France, Germany		Lynch & Simon (1999) [101]
	Europe		Melossi (2003) [106]
	England	Ministry of Justice	Banks (2011) [102]
	Italy & rest of Europe		Solivetti (2012) [93]
	England & Wales	OECD	Bell et al. (2013) [107]
Crime by specific foreign nationalities	Spain	Ministerio del Interior (MIR)	Alonso-Borrego et al. (2008) [108]
	Spain	Instituto Nacional de Estadística (INE)	Alonso-Borrego & Vazquez (2012) [92]
	Spain	Statistical Institute of Catalonia, Moso d'Esquadra, Instituto Nacional de Estadística (INE)	Westbrook (2013) [109]
	Netherlands	Police Recognition System, Social Statistical Database (CBS)	Blom & Jennison (2014) [110]

Bianchi et al. (2012) examined the relationship between crime and immigration in Italy, estimating that a 1% increase in migrants could be associated with a 0.1% increase in total crime, an effect stronger for property crimes, especially robbery and theft [104]. In Spain, Alonso-Borrego et al. (2012) noted the political and public concerns regarding global migrants and crime but also that there was a distinct correlation between the two over the preceding decade [92]. Bell and Machin (2013) carried out a number of studies examining the relationship between migration and crime in the UK [97, 107]. Using two different immigration groups – asylum seekers from the late 1990s and early 2000s, and A8 migrants – they examined the impact of migration on violent and property crimes [107]. They found no significant effects on violent crime rates, a “*modestly positive*” correlation between asylum seekers and property crimes and a “*significantly negative*” correlation between A8 and property crimes [107].

An explanation offered by scholars for the link between migration and crime is that migrants may be more likely to offend than natives because of the poorer economic conditions they face [93]. Immigrant crime may be a result of the experiences of immigrants in host countries [111]; an inability to achieve societal goals and success, or even a basic standard of living, through legitimate means (for example not being permitted to work or claim benefits) leading some to choosing criminal means to obtain their goals or needs [111].

It has long been argued in economic literature that criminal activity is related to lack of available legal opportunities, and that people engage in criminality because their costs and benefits differ from law-abiding people [112]. It therefore follows that EU migrants who are in employment (and with suitable conditions and pay) are no more likely to commit property crime than any other nationality, but may turn to acquisitive crimes if they face limited labour market opportunities [113].

It has been suggested that offending is more likely to be committed by newly arrived migrants, and that as migrants become more settled and familiar with local ways and expectations their criminality decreases [114]. There is evidence that countries with better immigrant integration policies have experienced crime by foreign nationals [101]. The rights granted to EU member state nationals should allow for easy immigration and integration into a destination country, however it is not always easy [115] and is likely to have been more difficult for Romanian and Bulgarian nationals than other EU nationalities, due to restrictions placed on them.

Age, gender and crime types committed by foreign nationals

Hirschi and Gottfredson (1984) determined that the age of offenders committing crimes against individuals (14-19 year olds) “*peak later than property crimes*” (19-24 year olds), and the rate declines more slowly with age [116]. Nagin and Land (1993) conducted a study on individual offending patterns – asking whether offending rates varied with age and whether the age-crime curve peaked or was flat [117]. They found that the individual-level average offense rate (per unit of time) varies as a function of observable individual-level characteristics and the age trajectory of the offense rate is generally single peaked rather than flat.

In 1986, Farrington was the first scholar to examine knowledge surrounding the age crime curve in detail. The age-crime curve shows criminal activity grows steadily from a young age, peaks at around 17 years old and then declines somewhat quickly as the offender gets older [118]. Further work in 2003 identified that the age of onset of offending was most typically between ages 8 and 14, earlier with self-report data and later with official records, while the age of desistance from offending is typically between 20 and 29 (though a small subset of offenders continue well into adulthood). He also found that different types of offences tend to be first committed at distinctly different ages [119]. A subsequent study by Farrington (2006) found that the most prolific offenders start early and have long criminal careers [120]. Almost all of those who were first convicted at ages 10–13 (91%) or 14–16 (84%) did not give up offending after the first offence. On the contrary, they continued offending (according to convictions) for an average of 13 years. Those who started at age 10–13 averaged nine convictions and those who started at age 14–16 averaged six convictions. In contrast, those who were first convicted at age 17 or older averaged only about two convictions each. Hence, an important policy aim should be to prevent (or postpone) the early onset of offending.

Francis et al. (2004) state that age of first conviction can determine the length of a criminal career [121]. The estimate mean length for a male offender first convicted at the age of less than 15 is just less than 10 years. Similar to findings from Farrington (2006) however younger first conviction rate is linked with longer age profile rather than less frequent offending [120]. A correlation between age and crime and the peak in adolescence and decline was identified [116, 119], and Hirschi and Gottfredson (1984) claim the relationship between age and crime is ‘invariant’ regardless of sex, race, country, time or offence; age had a ‘direct effect’ on crime [116].

The nature of crime by different nationalities has received little direct academic attention in Europe [110]. Work in the UK has tended to aggregate crime by foreign nationals broadly, ignoring differences between nationalities and in the type of crime committed [94]. Anecdotal evidence from ACPO, Cambridgeshire Police, and criminal justice professionals interviewed for qualitative studies [114, 122], suggest that there are certain crime types

which EU migrants have a tendency to favour. However, there is no previous robust evidence to suggest that these migrants are more likely to commit particular types of crime. This paper continues with a review of literature relating to EU immigration and crime, theoretical explanations of immigrant crime, and summary of existing evidence, followed by the research methodology, results and discussion of findings.

An unpublished report by the U.K. Association of Chief Police Officers (ACPO: redefined April 2015 as the National Police Chiefs Council but referred to throughout this report as ACPO due to chronological linkage) on the impact of accession migration on crime and policing in 2008 claimed there was no evidence of the suggested Eastern European crime wave, but that East Europeans were more likely to commit certain types of offences. Whilst remaining unpublished the reports existence and part content is echoed through media coverage and reference by senior Police Officers within governmental committee hearings.

According to the varied media coverage of the report, it specified people trafficking and exploitation, Polish people drink driving, Romanian children used to commit robberies [123]; public order, violence, pick-pocketing, extortion and alcohol related offences [124]. A further report by the House of Commons [125] stated an association between Eastern European migrants and alcohol related criminality, debt related assaults and labour and sex trafficking. The report does go on to emphasise that migrants are no more likely to be involved in crime than the native population. This is echoed by Baker et al. (2012), whose interviews with criminal justice system professional in Wales suggested that migrants did not offend any more than the native population but that when they did it was more visible than natives offending [114]. They also found that accession migrants were associated with certain offences (alcohol related, driving offences, domestic violence and shoplifting) and not associated with violent offences generally [114].

Stansfield (2014) tested the impact of Polish, Lithuanian and Romanian immigration, as well as all recent immigration, on total crime and different crime types at Local Authority level, using immigration data from the U.K. Office of National Statistics (ONS), and crime data from data.gov.uk [113]. The analysis showed that recent immigration is not associated with murder, robbery or sex offences but is linked to drug offences. His analysis also appeared to show that areas with the highest proportions of Polish nationals in the population have higher rates of robbery and sexual offences, although these correlations are not present when structural disadvantage is controlled for. No association was found between Lithuanian and Romanian immigration and any crime types [113].

Greek research has identified that the proportion of offenders who are foreign varies by crime type: highest for begging, followed by robbery and theft, and low for bodily injury offences [126]. Bianchi et al. (2008), looking at reported crimes in Italian provinces found that the causal effect of immigration on violent, property and drug crimes was not

significant [98]. The only crime type found to be significantly and positively affected by immigration was robbery.

Alonso-Borrego et al. (2008) found that rates of property crimes in Spain were higher for foreigners than natives, especially Algerians and Romanians. They further suggest some degree of specialisation according to nationality, identifying that Romanians concentrate in property offences and Moroccans in drug trafficking [108]. Their theory of specialisation according to nationality is supported by Dutch research [110] who also found differences in the types of crime favoured by different immigrant groups. In particular Eastern Europeans were shown to have a far higher rate for property crimes than other crimes and Latin Americans have higher rate for drug-related crimes than anything else.

Previous American research has found that immigration increased property crime and robberies, but did not affect rape and assault [127]. Spenkuch (2014) suggests that these findings indicate that it is financially motivated crimes which are most related to immigration, but that this relationship will vary according to the different labour market outcomes of different nationalities [127]. Other research also suggests that limited access to legitimate opportunities can lead to more crime [128].

Belmonte et al. [129] investigated links between immigration and crime in Spain. They found that both immigrants and natives have contributed to the increase in the crime rate. However, the contribution of immigrants seems to be relatively higher, partly explained by immigration contributing to an increase in the collective males aged 20 – 50 who are responsible for most offences. They found significant differences in the behaviour of immigrants towards crime by their nationality of origin, suggesting nationality influences age/gender/crime type. The crime gap between immigrants and natives is moderate, and can be largely explained by a higher propensity of immigrants to commit minor offences. This type of crime, although being the less serious, generates a strong perception of insecurity among native populations, but its number has decreased in recent years.

Research by Northumbria University included a significant literature searching and review exercise of which this report provides succinct coverage. Academic literature on migrant crime was found to be limited, contemporary criminological and geography discipline studies tending to focus more on organised crime involving cross border offending activity with limited outputs on offending by non- nationals within an EU Member State.

This lack of established material identified substantial knowledge gaps in terms of the offending by intra-EU migrants within member states and the potential diversity of spatial offending contexts and attributes of offending groups within intra-EU migrant nationalities. Poor understanding of such context impacts on the ability to provide suitably informed strategies of resourcing criminal justice assets and developing informed crime prevention policies. Consequently knowledge gaps provided the required drivers to the Northumbria project of developing a clear understanding of the spatial and human/criminal career

attributes of intra-EU migrant offenders. The project objectives sought to develop an analytical model of intra-EU migrant offending transferable across project partner member states to identify the nature and diversity of such offending.

Whilst not a signatory to Prüm the UK presented the opportunity to develop a suitable 'pilot' analytical model given the knowledge contained within the research team concerning the type, volume and accessibility of suitably geo-referenced criminal justice and crime/offending data held by public authorities. Research work therefore followed two distinct avenues namely:

1. Development of a transferable, robust and intuitive analytical model of intra-EU migrant offending within England between 2011 and 2013 and
2. Exploration of data existence and public availability within project partner member states (and wider) to accommodate the transferability of a UK based analytical model

The review of literature identified three particular aspects of such an analytical model lacking in contemporary knowledge but potentially impactful on policy consideration, namely the spatial nature/diversity of offending, the age/career profile of migrant offenders and the types of crime committed in host countries. The project remit required the use of publicly available data so allowing national scale pictures to be developed.

Methods and Results

Freedom of Information Act (2000)

Data applicable to this research was of two forms, namely socio-economic data generally available such as population and labour statistics typically drawn from central government funded inclusive surveys or governance activities and specific sub-sets of crime related data generated from within the criminal justice system. In order to investigate patterns of migration and crime in England, the Freedom of Information Act (FOIA 2000) was utilised [130]. The Act came into force in 2005 and requires public authorities to provide access to any information held, albeit with certain exemptions. Requests require two initial stages: determining whether the requested information is held, and what staff costs will be incurred during the extraction and provision of the data. Public bodies will freely provide data incurring low staff costs, but may require payment prior to collection and data release if the cost is more substantial. Police compliance with the FOIA has been found to be positive [131, 132].

The act is a resource providing access to data that may otherwise be unavailable, usually due to remaining unpublished. It was implemented to end the 'entrenched culture of secrecy' established in UK Government in the 1990s [133]; moving towards improving transparency, openness and increasing public trust and accountability in the public sector [134, 135]. The Act is also considered to represent progress in reducing the barriers to data [132, 136], granting access to a valuable range of material otherwise inaccessible or problematic to obtain.

Legislation providing access to information and data held by governments and public agencies is not however an English phenomenon. Banisar (2006) notes it being apparent in 70 countries worldwide whilst in progression with 50 others [137], Hazell and Worthy (2010) extend progress to 90 countries with freedom of information structures apparent in their article four years later [138]. The United Kingdom was one of the last countries of the developed world to adopt such access legislation [139].

Data was requested from 39 police forces in England relating to the nationalities and offences committed by non-native offenders [140, 141]. In total three requests were made:

- FOI request 1: *please provide data relating to the number of foreign nationals charged with an offence and the crime type charged with, for the calendar year 2011 and 2012.*
- FOI request 2: *please provide data relating to the number of foreign nationals charged with an offence and the crime type charged with, for the calendar year 2012 and 2013.*
- FOI request 3: *please provide data relating to the number of foreign nationals charged with an offence, the offence charged, the age and gender of the offender for*

each of the following nationalities: Polish, Portuguese, Romanian, Latvian, Lithuanian, Czech, Italian, Irish and Slovakian; for the calendar year 2012.

Data requests retained a focus on persons charged with a criminal offence. As opposed to arrested or convicted, charging of an offence falls between the two. Charging is the lawful process formally notifying an arrestee of the intention to prosecute. Following an arrest and subsequent investigation, evidence for all but some minor offences are referred to a prosecution lawyer to determine whether a formal charge is appropriate and what that criminal offence is. This is a step beyond an arrest which seeks to secure evidence for an investigation. Significantly low level offences can be dealt with post arrest through non-court procedures (e.g. formal cautions or penalty notices for disorder that require a fixed sum fine rather than a formal charge).

Within England four broad categories of crime data detailing a known offender exist:

- Crimes recorded by the police as 'detected/resolved',
- People arrested by the police for criminal offences,
- People arrested and charged with a criminal offence by the police or
- People convicted at court of a criminal offence.

Of these, the majority of English Police forces could or would not provide details of the nationality of the individual recorded within detected crime reports due to limited data collection. For convictions the English court system followed suit; courts are additionally unable to provide spatial information concerning a conviction beyond stating which court (geographically) dealt with the case. Some forces were able to provide information relating to the nationality of individuals arrested for a specific criminal offence, but as a criminal justice measure arrests provided inconclusive information on the true nature of the offence committed or a suitable measure of potential guilt.

Across England it is the individual Police Forces who retain ownership and responsibility for the recording of crimes and subsequent investigation activity leading to identification of an offender. Reporting up the governance chain to the optimal level of national government, the 39 English Police forces remain the data creators, holders and owners. In the majority of cases Police Force areas are coterminous with County areas, or at least very closely associated. Use of areal units representing the spatial extent of policing responsibility held by individual forces therefore becomes a suitable and data relevant scale of spatial examination.

Request 1: 2011 data – main results

Police Forces were requested to provide the number of persons charged during 2011 (calendar year) by nationality, figure 2 displaying the areal units represented in the context of England as the macro scale and identifying those forces unable to supply data for 2011.

- Six were unable to provide data, unable to provide data freely or provided data in a format that could not be aligned in a satisfactory manner with other forces.
- Data from the Metropolitan Police Force (outer London) and the City of London Police were combined to create one area known collectively as 'London'.

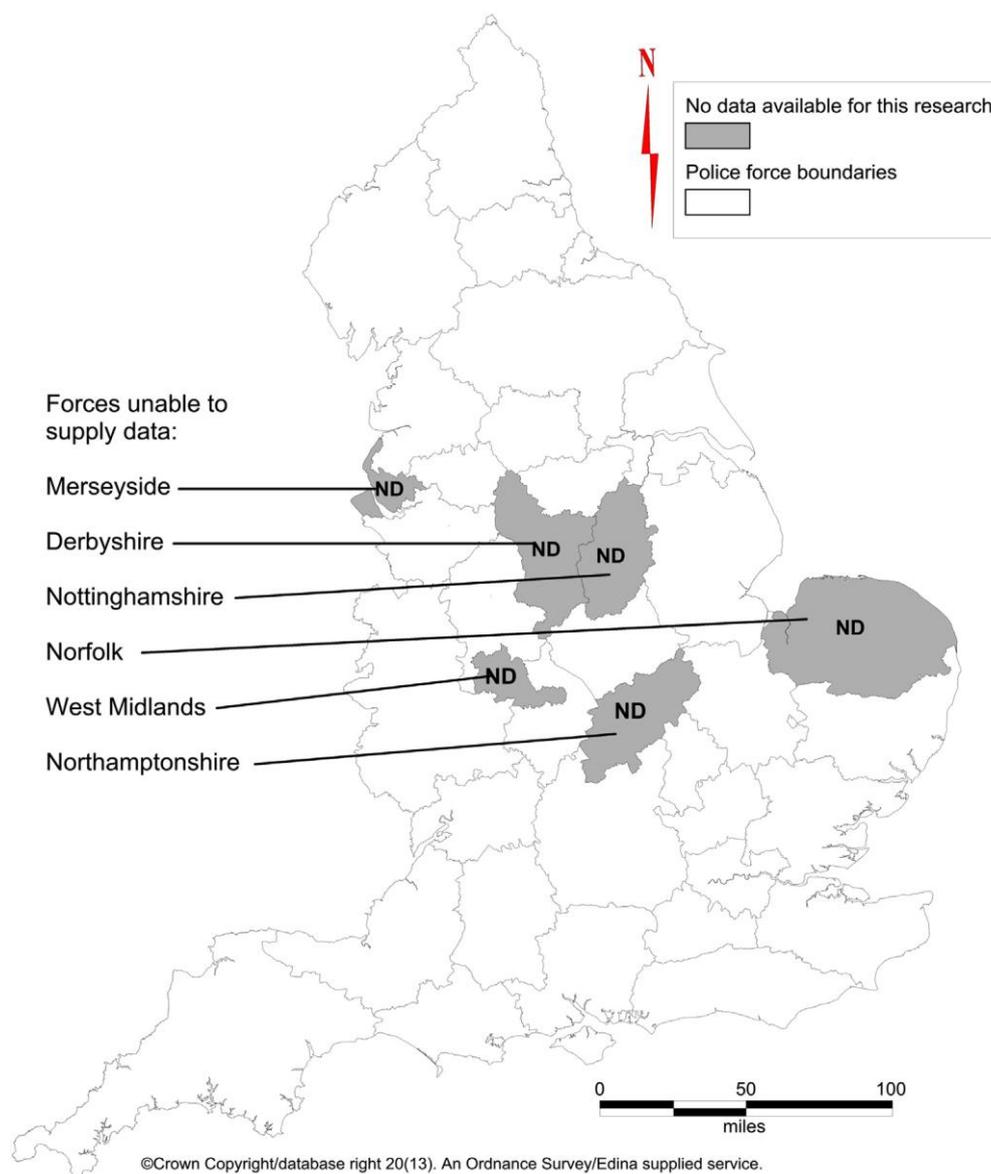


Figure 2: English Police Force areas requested to supply data

Crime figures for 2011 for all Police forces indicated that EU nationals charged with offences accounted for approximately 1% of all recorded crime in the UK [142]. Of the 27 EU nationalities examined (Croatia excluded) 74% of all prosecution charges aligned with A8 and A2 nationalities. Poland, Romania and Lithuania accounted for 59% of all prosecution charges against non UK EU nationals.

Statistical analysis was carried out using the Median and Absolute Deviation (MAD) factor analysis (a description of this technique can be found in appendix 1), to test data diversity. This technique identified six nationalities of interest: Latvia, Lithuanian, Polish, Romanian, Italian and Portuguese.

Measures of spatial autocorrelation were employed for the counts of charges by nationality, rates of migrant charges per nationality by force area population and lastly by force area total 2011 crime [146]. Further analysis using Morans I was carried out and provided a global value accounting for spatial diversity of such offending across England. Local Morans I measures each Police Force area indicating its similarity or dissimilarity with neighbours and was also applied.

Morans I indicates positive spatial autocorrelation is exhibited by all but Italian, Latvian and Polish crime counts, however, it is only Romanian offending rates per total force crime and rates per force area population which are considered statistically significant ($p = 0.001$). Local Morans I provide an indication of the similarity or dissimilarity between neighbouring regions/forces. A positive Local Morans I value indicates a Police Force area which has neighbouring areas displaying similarly high or low attribute values. The Force area is part of a cluster of similar attributes (albeit reference must be made to the observed value to identify whether this is a 'hot' or 'cold' spot). A negative value indicates neighbouring Force areas with dissimilar values, suggesting it is an outlier. These values can only be considered significant when in view of corresponding standardised Z scores [143].

Local Morans I values were calculated for all the Force areas that provided data. For each nationality, a high negative Z score greater than 3 was apparent for London, accentuating its outlier status due to extreme counts of charges. High values outside of London were limited in number and only in the case of Romanians were values > 1.96 seen (see figure 3).

Charges against Romanian migrants display positive 'hot' clustering with regard to rates against the total crime for force areas in a zone best described as the South East. South Yorkshire displays a positive Z score but with low intensity indicating clustering as a 'cold' spot. Polish and Latvian's both display 'hot' activity in Lincolnshire (East coast), however for Polish nationalities a negative Z score reported indicated Lincolnshire as an outlier of Polish activity, whereas for Latvians it is clearly indicating 'hot' clustering in this zone of Police Force areas. Additionally for Poles, Cumbria (North) is a high value outlier whilst Surrey (South East) is one of low value.

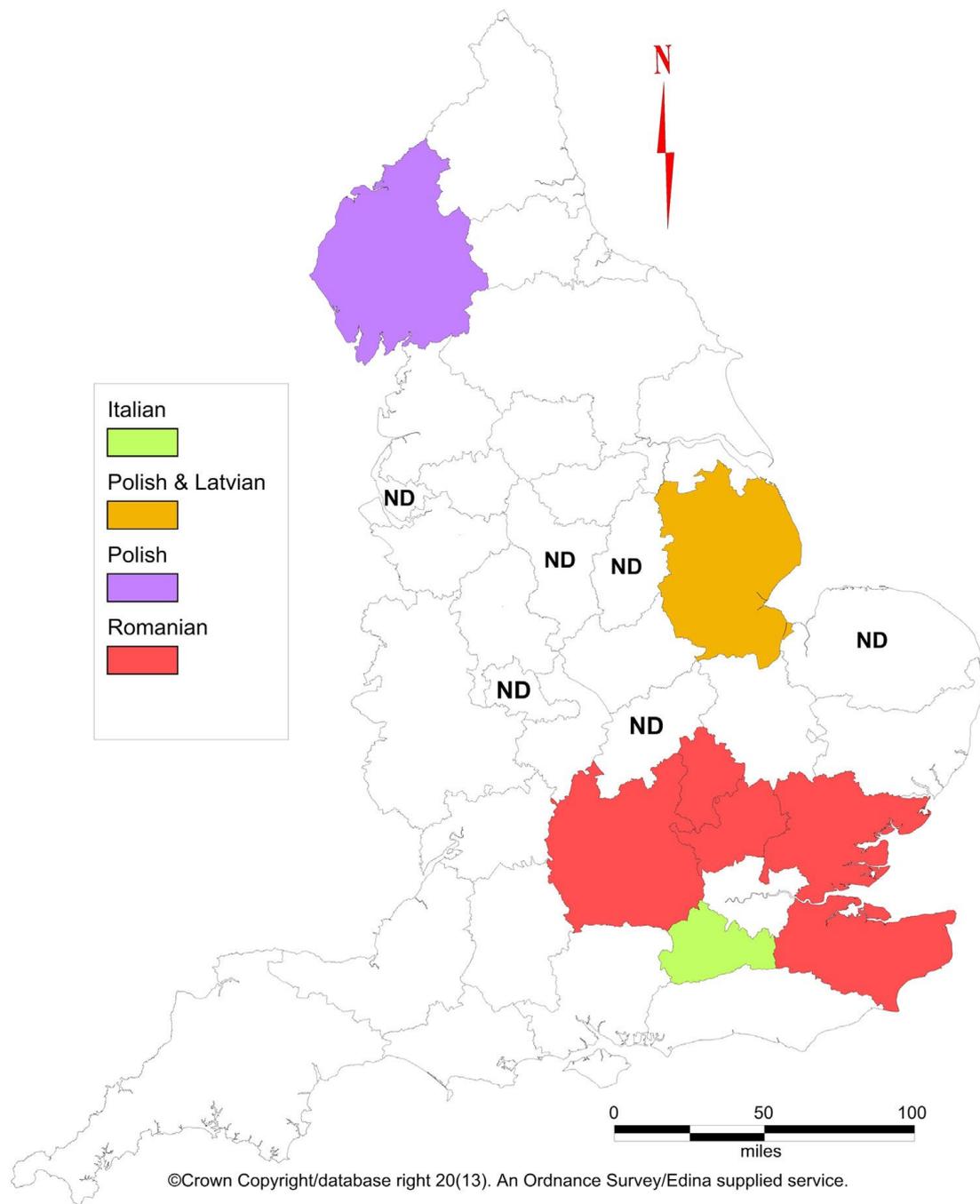


Figure 3: Police Force areas displaying Local Morans I adjusted Z scores >1.96 with high value intensity measurements.

Lithuanian and Latvian nationals highlight the Eastern zone as containing police force areas displaying high MAD factor values (>2), with the exception of the rate of charges per Lithuanian population. The spatial distribution of Lithuanian and Latvian nationals committing crime to a comparatively high volume is clearly focused throughout the East and parts of the South East. In the South East there is inconsistency between these two

nationalities; Lithuanian's featuring to a greater degree in London and especially Sussex whilst Latvian focus remains on Essex, Kent and London.

The distribution is relatively distinctive from other nationalities analysed, and may be due to specific land use in the East (e.g. agribusiness related which potentially utilises a high number of seasonal workers). McCollum et al. (2013) report on spatial, sectoral and temporal trends of A8 migrant labour, noting an influx to particular labour market sectors such as agriculture and service industries [144]. Their analysis suggests that whilst agriculture employs only about 1% of the population, one quarter of those employees in 2011 could have been from A8 countries.

It is only Latvians who display extreme values in Western zone force areas as a rate per total population or per total force crime although both Latvian and Lithuanian nationalities feature in the area of Staffordshire, together with other nationalities. Polish nationality maps display a far more general dispersal across the country with Hampshire (South coast) consistently high in MAD factor values. There is little evidence beyond this feature of a spatial concentration of activity.

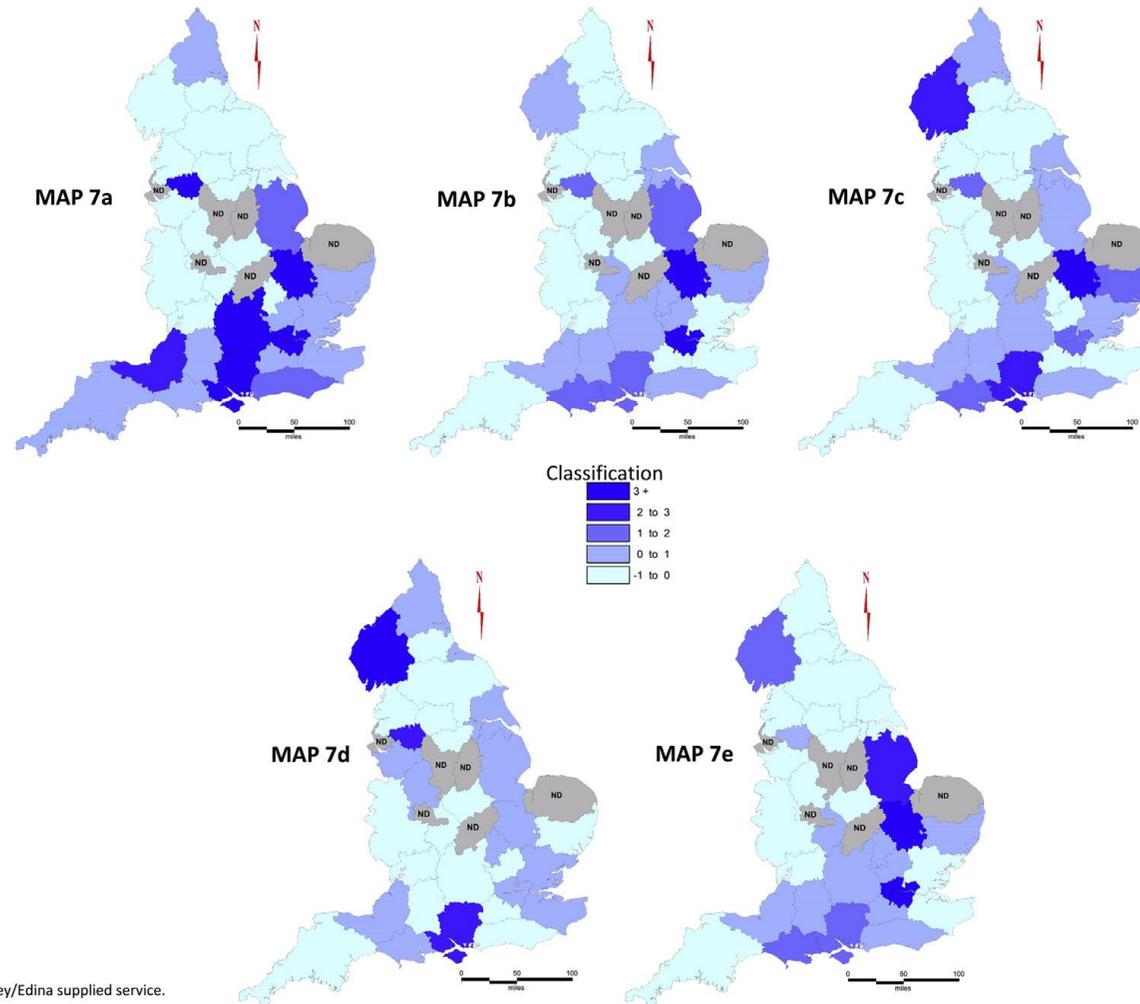
Polish nationality maps (see figure 4) suggest more general spatial diversity but drawn to the South and East. High MAD factor values routinely appear in Cambridgeshire and in terms of EU or nationality population also in Cumbria although actual counts in Cumbria are extremely low and therefore of limited value.

Counts of prosecution charges against Italians identify London and adjacent force areas in the South as high in volume. No other rates used corroborate this impact, high values being limited to London except on consideration of the rate per Italian population, which is in the low hundreds for many force areas displaying a high rate. Italian's charged in London amounted to 1,514, the next highest area being Greater Manchester at 50 and all other areas ranging from 0 to 35, therefore displaying no spatial diversity outside of London [146].

Analysis and Geographic Information System (GIS) mapping of available data confirms anticipated patterns of criminal activity regarding A8 and A2 migrants, but notes a wider potential dispersion of Polish and other EU nationalities which have a longer time line of movement into the UK. Particularly apparent is distinctly low criminal activity in a central zone of England with high activity in selected force areas dependent on the zone in which they exist and the nationality of the immigrants in question.

Interrogation of publicly available socio-economic data and subsequent analysis highlighted the poor integrity of population data with regard to counts by nationality. It was not possible to consider offending within the context of a rate of offending by population of the offenders' nationality due to such low integrity.

Map 7a - MAD factor: charge counts
 Map 7b - MAD factor: charge rate by population
 Map 7c - MAD factor: charge rate by EU population
 Map 7d - MAD factor: charge rate by Portuguese population
 Map 7e - MAD Factor: charge rate by all force crime



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Figure 4: Polish nationality. ND = No Data. Colour White = MAD factor < -1.

Request 2: 2012-2013 data – main results

Data was sought from all English Police Forces (n = 39) on the counts of persons charged with criminal offences during calendar years 2012 and 2013 itemised by EU nationality. Thirty-six Police Forces responded positively (Derbyshire, Humberside and Norfolk declined to disclose information). Data received was analysed spatially, with polygons of Police Force boundaries forming the spatial units. MAD factor analysis identified six nationalities of interest: Latvia, Lithuanian, Polish, Romanian and Portuguese (the same as 2011 data), however it also identified Eire as of interest (as opposed to Italian in 2011).

An intuitive analytical model providing a valuable method of spatial diversity visualisation remained one imperative of the research. Choropleth mapping is perhaps the most common method of visualisation readily accepted and utilised across disciplines and professional practice but potentially problematic in portraying correct significance of colour change. Classification of numerical categories can at times be misleading if not suitably applied and possibly confusing if application is bound to significance through a non intuitive statistical method. Seeking to resolve this issue Location Quotients (LQs) and Standardised Location Quotients (SLQs) were applied to further spatial analysis (see appendix 2 for description of test), a method with acknowledged value but emanating from economic and development disciplines rather than analysis of crime where it has received very little consideration. In addition Gini coefficients and Lorenze Curves were utilised and provided further corroboration of the LQs as a valuable method for identifying areal unit significance of offending counts in the wider national context.

SLQ's were established for each accepted offending distribution and the Police Force areas attracting significant high scoring outliers were identified [145]. Of the 11 SLQ arrays, Cambridge Police area features in seven and is the most commonly seen area. Eire attracted no significant outliers.

With the caveat of London aggregation, of the six nationalities examined varying levels of spatial diversity of offending were inferred by the volume of Police Force areas with significant SLQ's for each. In 2012, Polish offending (SLQ unavailable for 2013) attracted nine outlier Police Force areas, Romanian four, Portuguese three, Latvian two and Lithuanian one. In 2013, the diversity increases most notably for Latvian offending attracting outliers in three coterminous Police Force areas on the East coast (limited to Cambridgeshire Police Force only in 2012).

The main findings of this analysis were:

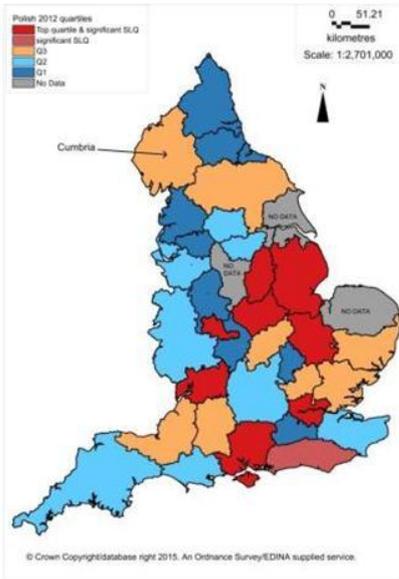
- Polish offending displayed the highest MAD factor values, the lowest Gini coefficient of inequality and the highest number of Police Force areas with significant SLQ scores in 2012. Top quartile Police Force areas corroborate significant SLQ identities with the exception of Sussex Police force.

- Romanian offending closely followed Polish offending in volume and MAD factor values, but inequality of density increased and significant SLQ scores were apparent in four Police force areas in 2012 and five in 2013. For the Romanian sample, Cheshire and Thames Valley Police force areas were added to the 2013 top quartile whilst Suffolk Police moved to Q3 and Cambridge to Q2. SLQ's for both Cambridge and Suffolk forces remained insignificant.
- Lithuanian and Latvian offending appears the most spatially focused of all intra-EU offending by nationality with significant SLQ's limited to Cambridge and the East Coast but top quartile Police Force areas expanding to surrounding areas.

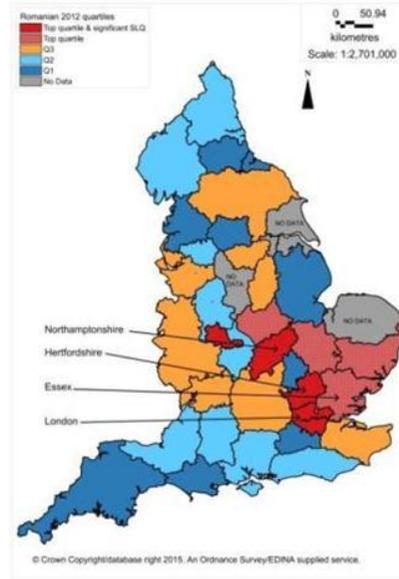
Spatial diversity was visualised using choropleth mapping, displaying significant SLQ's (see figure 5). Polish offending displays considerable spatial diversity but clusters towards the east and southern coasts. Cumbria (far North West) is within Q3, an area reported previously as a Polish outlier of statistical significance in 2011 [146].

Spatial examination of intra-EU offending across a three year time span utilising differing spatial analytical methods provides useful and relevant information on the spatial diversity or non-diversity of these offending groups [147]. Of the spatial analysis methods explored it was the opinion of the research team that the use of SLQs, Gini coefficients and Lorenz curves provides a more intuitive and visual model of spatial diversity displayed by intra-EU migrant offenders which is readily accessible by practitioners and researchers alike. The SLQ also provides flexibility in the subjective decision making of denominator which was found useful following the analysis of request 1 data which had established the very poor integrity of population data by nationality, so limiting the creation of offending as a rate of nationality population. Spatial aspects of offending differ between nationalities; they should not be spatially generalised, highlighting that the exploration of crime (and potentially the investigation and justice resource provision within country) by nationality requires spatial context knowledge to generate informed understanding [148].

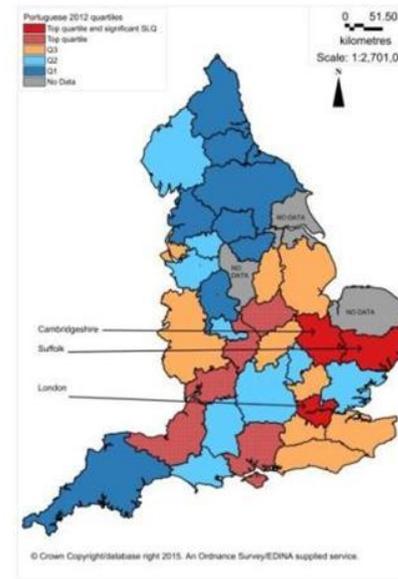
Polish 2012



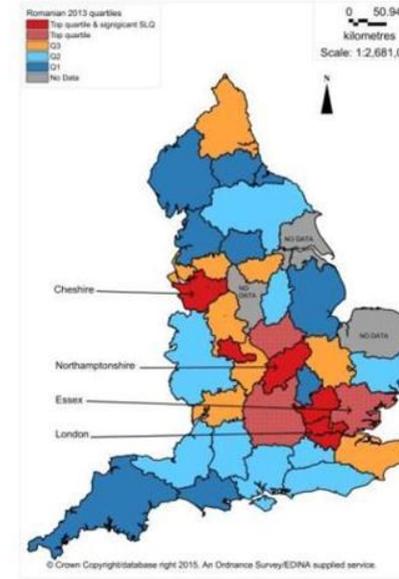
Romanian 2012



Portuguese 2012



Romanian 2013



Portuguese 2013

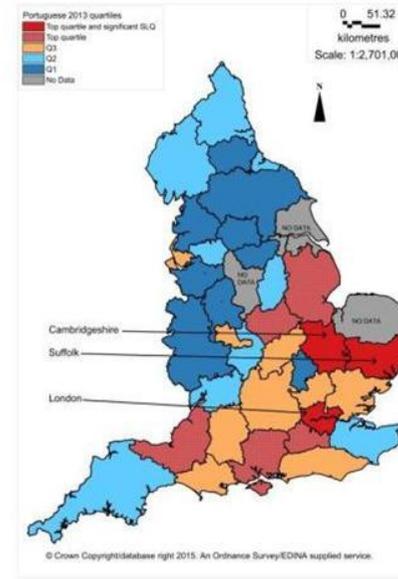
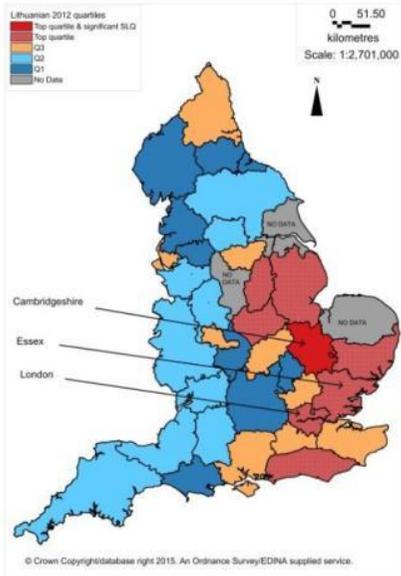
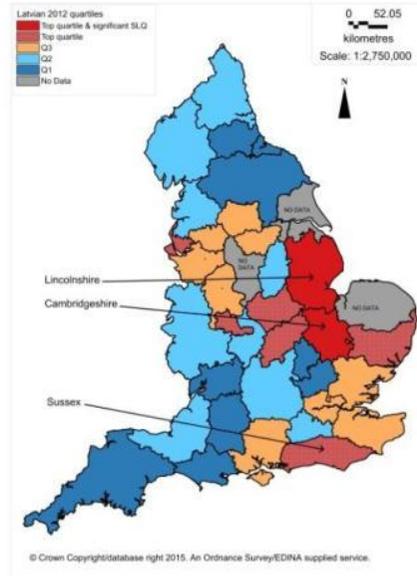


Figure 5: Lorenz curve quartiles and significant SLQs for a number of foreign nationalities

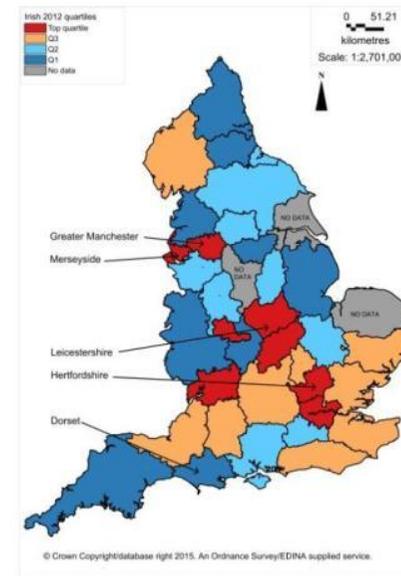
Lithuanian 2012



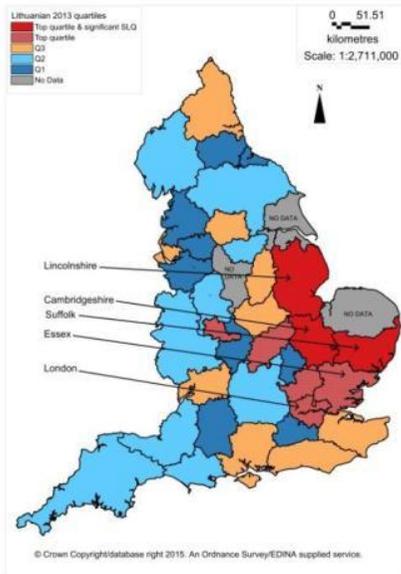
Latvian 2012



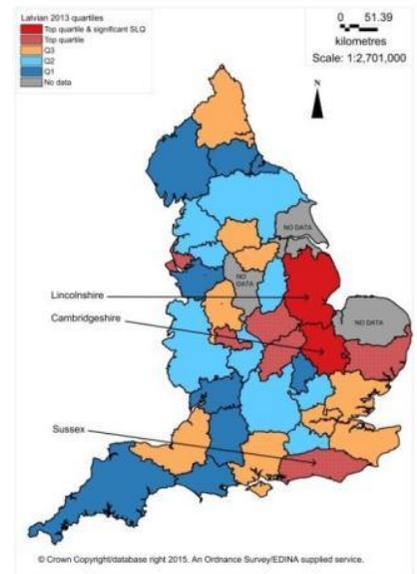
Irish 2012



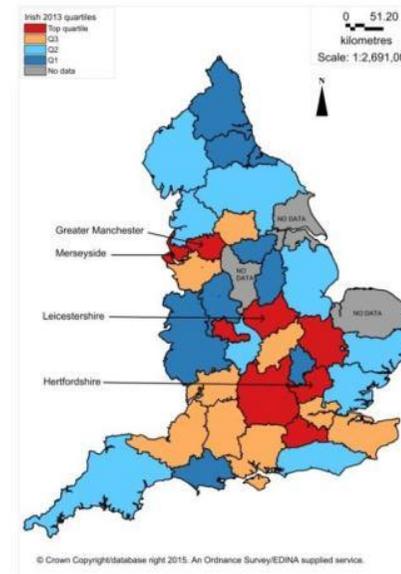
Lithuanian 2013



Latvian 2012



Irish 2013



Request 3: 2012 age, crime and gender data – preliminary results

Data was sought from all English Police Forces (n = 39) on the number of foreign nationals charged with an offence, the offence charged, the age and gender of the offender for each of the following nationalities: Polish, Portuguese, Romanian, Latvian, Lithuanian, Czech, Italian, Irish and Slovakian; for the calendar year 2012. Seven forces were unable to provide data, and a further five forces provided data but it was not in-keeping with the format of the analysis and therefore not used (e.g. male and female merged, no age specification, crime types not stipulated).

Within this research the data collected concerned the charging of individuals for criminal offending as previously described. In the UK charging an offender under the age of 18 years is dependent upon the circumstances and history of the crime and the individual, as alternative methods of entering the justice system and resolving the criminal issue will always be considered first. For instance, a 17 year old who has not previously offended and commits an offence not considered to be so serious that formal and quick entry in to the justice system is required may be summonsed to appear at court (an administrative process) as opposed to being charged by Police and taken before a court. Consequently it must be noted that the results of the research reported are biased towards age ranges greater than 18, those under 18 reflecting serious aspects of the offending or serious social issues with the younger offender; which may range from serious previous criminal history to more social care issues such as inability to formally identify, or significant concerns regarding parental ability or responses to a more informal entry to the criminal justice system. The research outcomes still provide useful age attribute information but do not seek to formally compare with the well-established ‘age crime profile’ discussed within the literature described. Table 3 provides a breakdown of the offending age profiles by aggregation of age categories. Whilst informative and indicative of potential differences aggregation loses detail and consequentially statistical testing was undertaken to seek confirmation.

Table 3: Average ages of offenders by nationality for the year 2011-2012.

Age Class	2011-12									
	England	CZ	IE	IT	LV	LT	PL	PT	RO	SK
0 -9	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10 - 17	12%	11%	6%	1%	2%	2%	3%	7%	5%	13%
18 - 24	32%	35%	18%	9%	29%	33%	18%	19%	41%	31%
25 - 34	28%	32%	30%	29%	46%	42%	49%	32%	37%	33%
35 - 44	17%	15%	22%	35%	17%	16%	21%	28%	13%	13%
45 - 54	8%	7%	15%	12%	6%	5%	8%	11%	3%	7%
55+	3%	1%	9%	13%	1%	1%	2%	2%	1%	3%

Age crime profiles for each nationality were compared with that of the UK aggregated offending population and between each nationality. Using a Fishers Exact routine the hypothesis that the median values of each profile (nationality, male and female combined) differed from the median values of the profile compared against was established. Testing the null hypothesis that no difference between median values existed resulted in establishing significant divergence from the UK aggregated offending population profile in many cases and also inter nationality divergence. Table 4 displays Fishers Exact test results for age profiles of nationalities (male and female combined) with corresponding p values reflecting a two tailed test.

Fishers Exact test is carried out within research to determine whether there are any non-random associations between two categorical variables; calculating the exact probability value of the relationship. This calculates the difference between the data observed and the data expected and is achieved through combining the two data sets where the values in each table are analysed to see which are greater than or less than the median, presenting a 2x2 contingency table [204]. This test is to further establish whether relationships within data are not random and the test therefore considers the data and decides whether the difference between variables is significant enough that it could not have arisen by chance. A p value is provided which if 0.05 or less reaches statistical significance.

Table 4: Fishers Exact test results for age profile comparison

	England	CZ	IE	IT	LV	LT	PL	PT	RO	SK
England		$p=0.962$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.5407$
CZ	$p=0.962$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.604$	$p=0.6546$
IE	$p<0.01$	$p<0.01$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.4205$	$p<0.01$	$p<0.01$
IT	$p<0.01$	$p<0.01$	$p<0.01$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$
LV	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$
LT	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$
PL	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$		$p<0.01$	$p<0.01$	$p<0.01$
PT	$p<0.01$	$p<0.01$	$p=0.4205$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$		$p<0.01$	$p<0.01$
RO	$p<0.01$	$p=0.604$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$		$p=0.172$
SK	$p=0.5407$	$p=0.6546$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.172$	

Overall it was found that

- Significant disparity of the age profile of offending is apparent between nationalities
- All foreign nationalities (the 9 nationalities data was obtained for) maintained their age profiles for each year (2011, 2012) and for the combined 2 year period.
- Czech and Romania have the same age crime profile. The Czech profile is also the same as the UK.
- Ireland and Slovakia have individual age profiles however the majority of offending stays in wider central age classes (18 – 45).
- Italy has the most divergent age crime profile as a large section of crime is in 55+ age brackets. It has the oldest mean age of offenders.

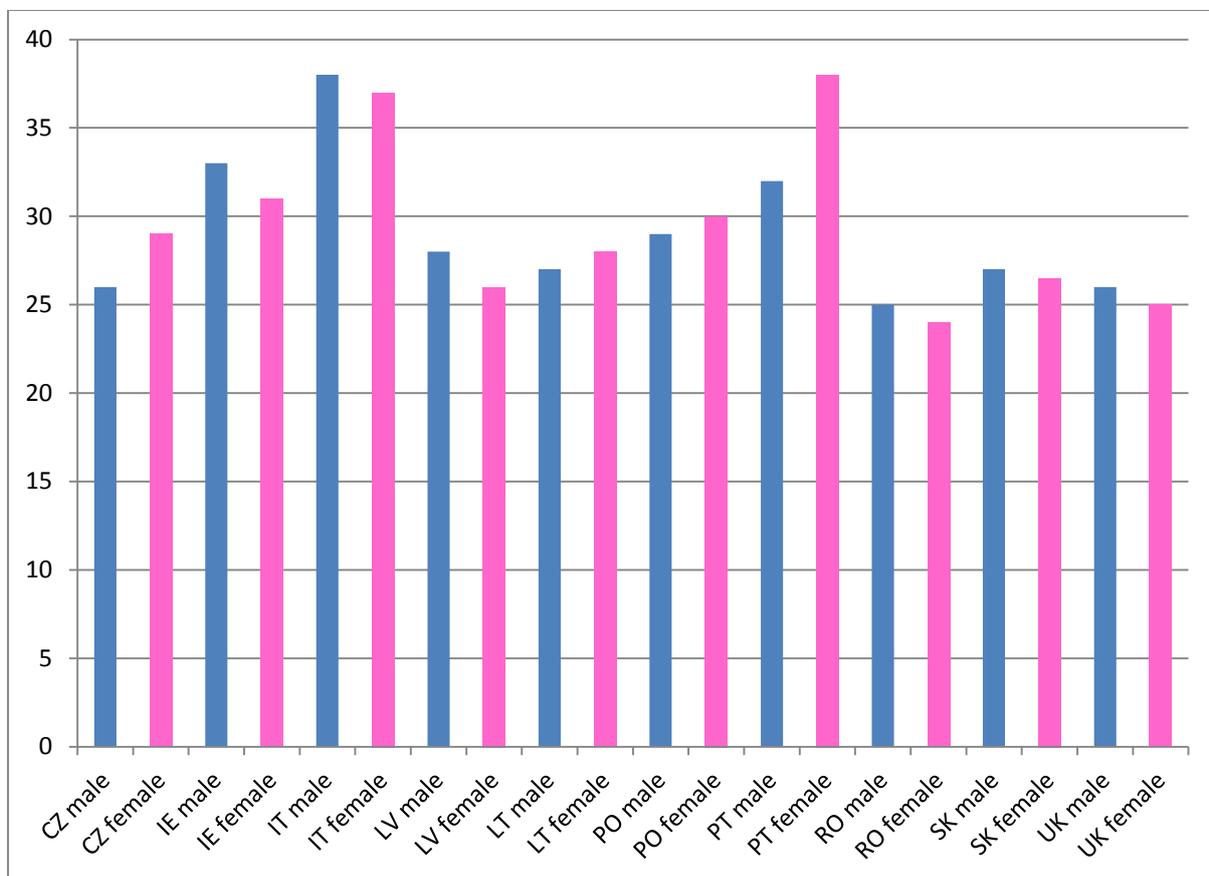


Figure 6: Mean age of offenders, separated by gender. The UK has been utilised as the aggregate 'benchmark' figure against which all comparisons have occurred.

Figure 6 illustrates that Italian nationals charged with offences are the oldest, and that Italian females are older than Italian males (+5 years). Romanians are amongst the youngest, and Romanian males were found to be younger than females (the opposite is true for most other nationalities). Males were charged with offences a significant larger number of times, compared with females (often two to three times more offences). Polish male nationals were charged with almost 6,000 offences, followed by Lithuanian males (4,000) and Romanian males (3,500). Highest females charged with offences were Romanian (1,000) and Polish (500).

Breaking down the offending data further by gender, table 5 illustrates a breakdown of offending by aggregated age categories suggesting differences between the aggregated England profile and individual nationalities and suitably accentuates the high age bracket of both Italian and Portuguese offending. The trend of small proportions of offending by youths between the ages of 10 and 17 except for those of Czech or Slovakian nationality is also apparent, although both appear comparative with the general English profile.

Table 5: Age crime profiles of offenders by nationality for the year 2011-2012

%	2011		2011-12																		
	England		CZ		IE		IT		LV		LT		PL		PT		RO		SK		
Age	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
0 - 9	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10 - 17	13%	9%	11%	10%	5%	7%	1%	2%	1%	4%	2%	3%	2%	8%	7%	4%	5%	7%	14%	10%	
18 - 24	31%	39%	35%	32%	19%	12%	8%	13%	29%	28%	34%	27%	17%	19%	20%	31%	40%	43%	31%	29%	
25 - 34	28%	25%	31%	36%	28%	39%	28%	33%	47%	38%	42%	44%	49%	43%	33%	31%	38%	31%	33%	37%	
35 - 44	17%	17%	15%	13%	23%	21%	36%	29%	17%	16%	16%	17%	22%	21%	25%	39%	13%	14%	13%	14%	
45 - 54	8%	8%	6%	8%	15%	12%	12%	13%	5%	12%	5%	8%	8%	9%	13%	7%	2%	4%	7%	5%	
55+	3%	2%	1%	1%	9%	9%	14%	10%	1%	3%	1%	1%	2%	2%	2%	3%	1%	1%	3%	3%	

Following the methodology within table 4, Fishers Exact test routines identified statistically significant differences between national offending age profiles and results are displayed in table 6.

With the hypothesis that median values of each profile (nationality, gender) differed from the median values of the profile compared against here it can be seen that inter-nationality divergence exists when the profiles are delineated to gender. Figure 7 provides counts of instances per nationality where significant difference with the age profile of another nationality was not encountered.

Table 6: Fishers Exact test results for nationality, age and gender

	UK M	UK F	CZ M	CZ F	IE M	IE F	IT M	IT F	LV M	LV F	LT M	LT F	PL M	PL F	PT M	PT F	RO M	RO F	SK M	SK F	
UK M		$p<0.01$	$p=0.54$	$p=0.69$	$p<0.01$	$p<0.01$	$p=0.78$	$p=0.14$													
UK F	$p<0.01$		$p<0.05$	$p<0.01$	$p<0.01$	$p=0.46$	$p<0.01$	$p<0.01$													
CZ M	$p=0.54$	$p<0.05$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.19$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.28$	$p<0.05$	$p=0.84$	$p=0.1$	
CZ F	$p=0.69$	$p<0.01$	$p<0.01$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.2$	$p=0.5$	$p=0.06$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.18$	$p<0.01$	$p=0.55$	$p=0.4$	
IE M	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$		$p<0.05$	$p<0.01$	$p=0.16$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.05$	$p=0.11$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	
IE F	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.05$		$p<0.01$	$p=0.83$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$								
IT M	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$		$p<0.01$	$p=0.62$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$								
IT F	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.16$	$p<0.01$	$p<0.01$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.05$	$p<0.01$	$p=0.17$	$p=0.62$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	
LV M	$p<0.01$		$p=0.77$	$p<0.01$	$p=0.22$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.13$								
LV F	$p<0.01$	$p<0.01$	$p=0.19$	$p=0.2$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.77$		$p<0.05$	$p=0.56$	$p<0.01$	$p<0.05$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.14$	
LT M	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.5$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.05$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.05$	$p=0.55$	
LT F	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.06$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.22$	$p=0.56$	$p<0.01$		$p<0.01$	$p<0.05$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.05$	
PL M	$p<0.01$	$p<0.05$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$							
PL F	$p<0.01$	$p<0.05$	$p<0.01$	$p<0.05$	$p<0.01$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.05$									
PT M	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.05$	$p=0.83$	$p<0.01$	$p=0.17$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	
PT F	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.11$	$p<0.01$	$p=0.62$	$p=0.62$	$p<0.01$		$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$							
RO M	$p<0.01$	$p<0.01$	$p=0.28$	$p=0.18$	$p<0.01$		$p<0.01$	$p=0.1748$	$p<0.01$												
RO F	$p<0.01$	$p=0.46$	$p<0.05$	$p<0.01$		$p<0.01$	$p<0.01$														
SK M	$p=0.78$	$p<0.01$	$p=0.84$	$p=0.55$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.05$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.1748$	$p<0.01$		$p=0.13$	
SK F	$p=0.14$	$p<0.01$	$p=0.1$	$p=0.4$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.13$	$p=0.14$	$p=0.55$	$p<0.05$	$p<0.01$	$p<0.05$	$p<0.01$	$p<0.01$	$p<0.01$	$p<0.01$	$p=0.13$		

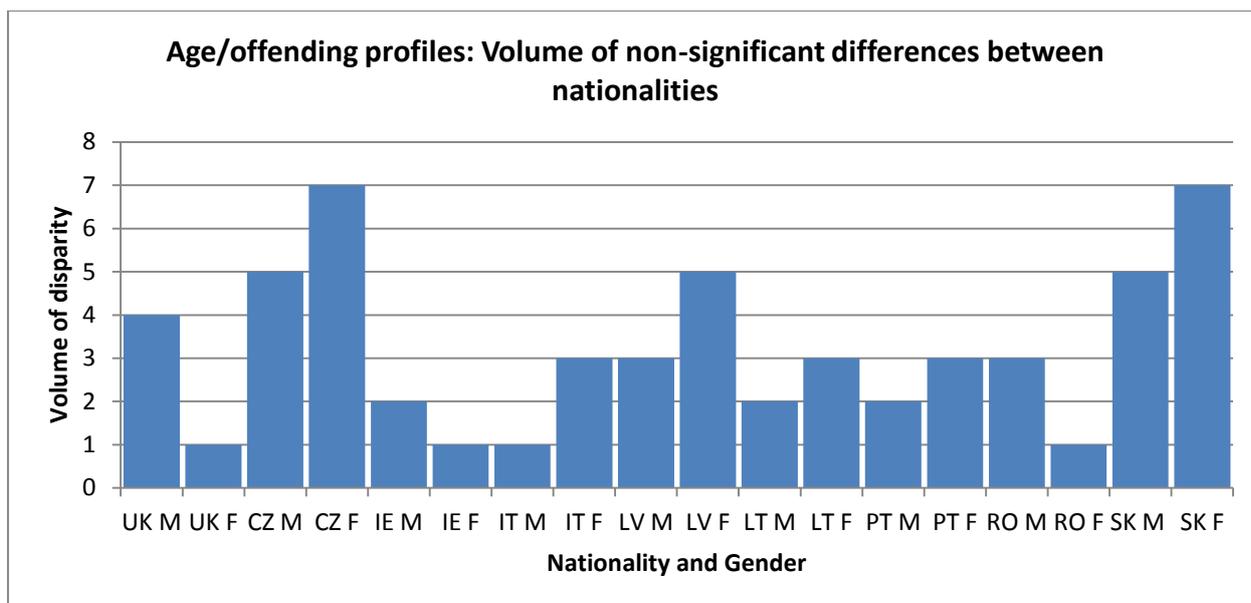


Figure 7: Counts of non-significant differences per nationality

Data for age and gender identified:

- There are significant differences in the peak ages of offending between nationalities and also against the inclusive population English profile, including within a breakdown by gender.
- Results indicate agreement with contemporary literature but provide valuable detail.
- Age crime profiles for both male and females are maintained within the, Latvian, Polish, Romanian and Lithuanian nationals.
- Czech and Slovakian nationalities display the lowest volume of significant inter-nationality profile differences

The FOI requests submitted also requested the offence type in order to explore any relativity between intra EU migration and crime types within England. A fourth FOIA request was submitted to all English Police Forces requesting information on the number of all nationalities in England charged with an offence, the offence charged and the age and gender of the offender. The data sought spanned a three month timescale; January to March, 2011. Any Welsh forces were removed from foreign national data in order to create an English model for analysis and as with the age profiles discussed previously, seven forces were unable to provide data, and a further five provided data that was not in-keeping with the format of the analysis and could therefore not be used. Some of the results received were already aggregated into groups, which were generally aligned with Home Office crime categories. Results which detailed individual offences were aggregated into the same format, the categories being: Acquisitive, Burglary, Violence, Sexual Offences, Drugs,

Criminal Damage, Fraud, Robbery, and Other. A breakdown of crime types included in each category can be found in table 7.

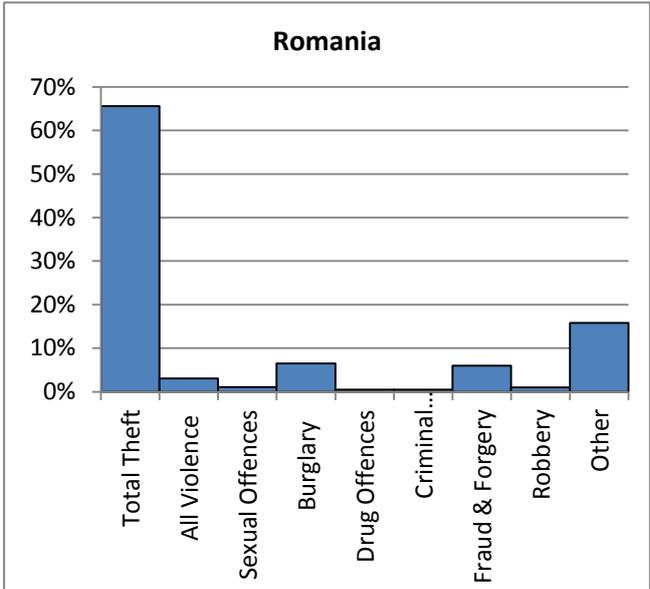
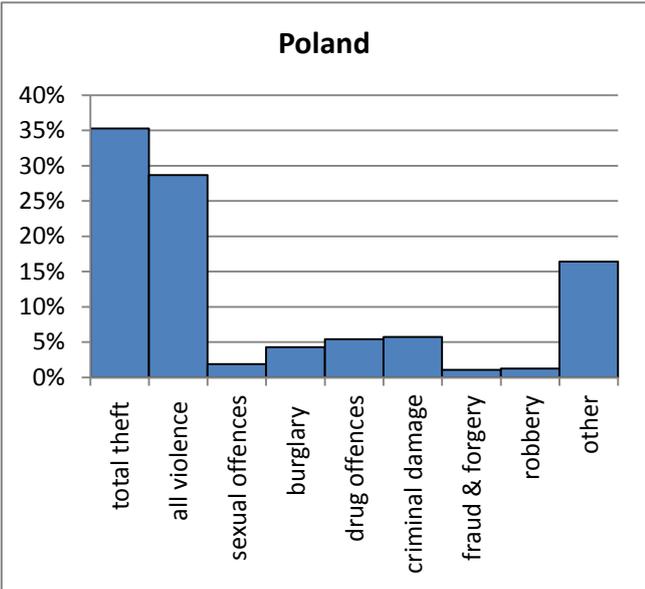
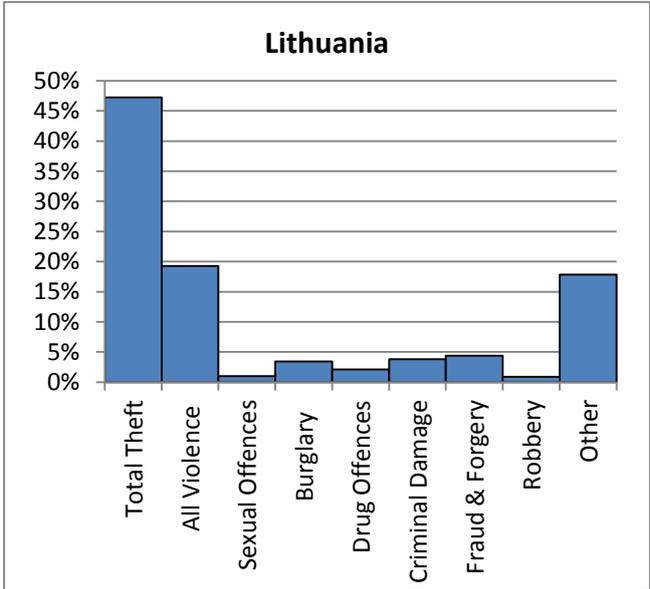
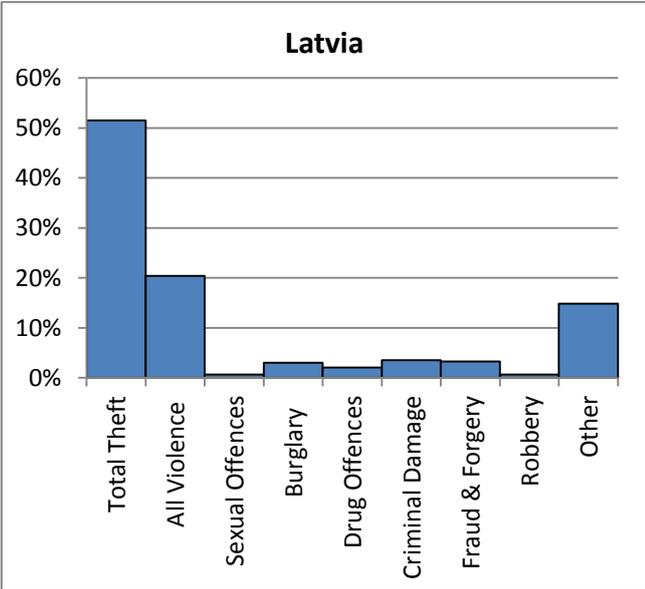
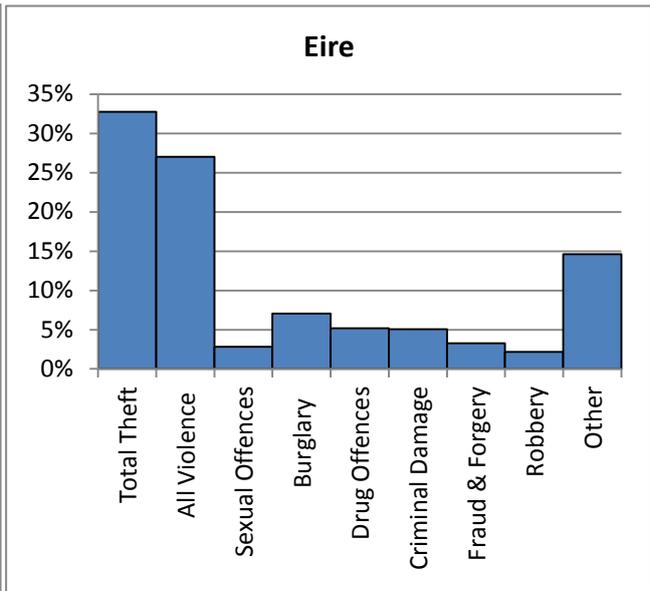
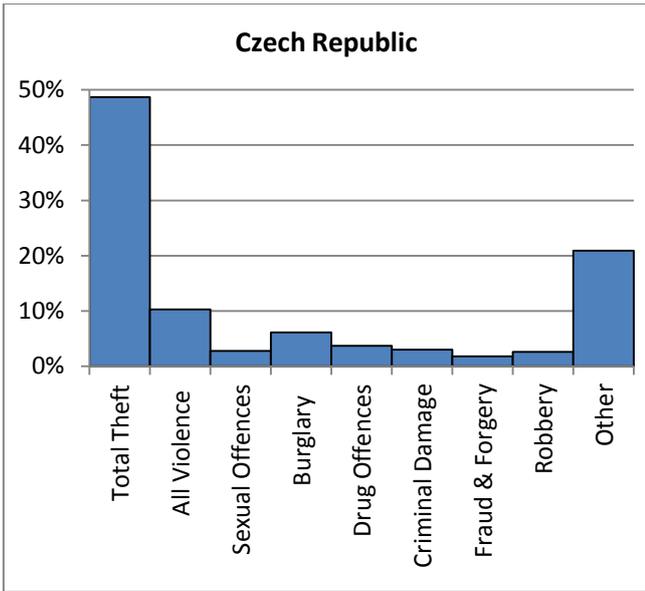
Figure 8 displays crime type profiles for individual foreign nationals and England by percentage of all offending in order to provide a comparative overview of the variance in the volume of types of crime being committed. Data displayed identifies 'All Violence' to be the prominent crime type in England where an offender is identified and formally enters the criminal justice system, followed by 'Acquisitive'. Data from the other nationalities examined display profiles of a converse nature but with significant disparity apparent.

Noteworthy aspects of the foreign national crime type profiles include the strong difference between 'Acquisitive' and 'All Violence' for Romania raising questions as to the reasoning behind the large disparities between the crime types and this variance from other foreign nationals. Preliminary results uncover that foreign nationals appear to be grouped in pairs with Lithuania and Latvia, Romania and Czech Republic, Ireland and Poland sharing similar crime type profiles.

Building on Hirschi and Gottfredson's (1984) assertion that "*person-crimes peak later than property crimes and the rate declines with age*" [116], questions can be raised as to whether links may be made between Romania's younger age crime profile (see Table 3) and the predominant acquisitive crime type profile found within Figure 8. Blumstein et al. (1988) uncovered links between age and crime types with research findings indicating distinct career paths for different crime types, implying differences may reflect the changing opportunity to commit different crime types at different ages [149].

Table 7: Individual crime types in aggregated crime categories

Acquisitive	All Violence	Sexual Offences	Other	Drugs	Damage & Arson	Fraud	Robbery	Burglary
Other Theft	Assault ABH	Soliciting	Breach of court order	Possess drug	Criminal damage	Fraud	Robbery	Burglary dwelling
Shoplifting	Wounding/ GBH	Voyeurism	Pervert justice	Intent to supply	Arson	False ID documents	Robbery of business	Burglary non-dwelling
Theft by employee	Assault without injury	Exposure	Going equipped	Supply drugs	Threat to damage property	Benefit Fraud		Burglary other than dwelling
Theft from machine or meter	Assault constable	Rape	Intimidate Witness / Juror	Production drugs		Forgery		
Theft from vehicle	Kidnap/ Abduction of child	Rape under 16	Possess extreme pornographic images					
Theft of vehicle	Possess weapon	rape of child under 13	False imprisonment					
Proceeds of crime	Harassment	sexual assault	Affray					
Make off without payment	Threats to Murder	sexual assault under 13	Begging					
Handle stolen goods	Cause fear of violence	sexual activity with child	Abscond from custody					
Attempted theft	Attempted Murder	assault by penetration	Offences relating to notification					
Abstract electricity	Murder	assault on under 13 by penetration	Drunk and Disorderly					
	Manslaughter	sexual activity in presence of child						
	Administer Poison	Prohibited image child						



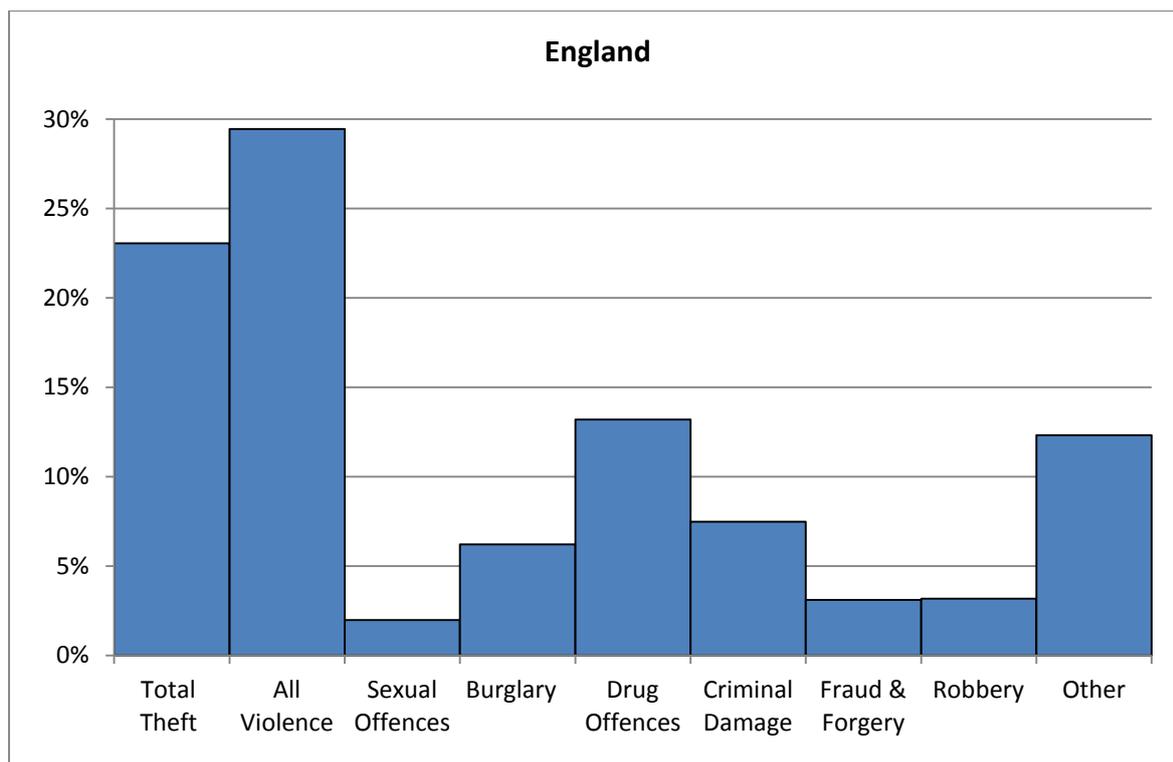


Figure 8: The percentage of individual crime types by total crime recorded for each nationality.

Comparing the crime type proportions data in Table 8 confirms England has a differing crime type profile compared to all foreign nationals (as shown within the table). 'All Violence' is the highest crime type whilst 'Acquisitive' is the peak crime type for every other nationality including Italy which has been included in this comparison. This data suggests Ireland, Italy, Latvia, Lithuania, and Poland not only share the highest crime type, but also the top two crime type proportions; 'Acquisitive', and 'All Violence' respectively. However Ireland, Italy and Poland show stronger similarities, with a shared percentage variance of 6% between these categories. This variance is also smaller than the other foreign nationals but is shared by the UK albeit with the reverse crime types. Although Romania and Czech Republic share 'Total Theft' as their peak crime types their second peak relies on 'Other' crime rather than 'All Violence' showing disparities between the nationalities lower crime types. The category of 'Other' captures offences such as alcohol related offences connected with driving, a category discussed in the literature as being particularly noticeable in CEE nationalities and may explain this apparent peak in crime types [114, 123-125]. An argument for a link between age and crime type could begin to emerge as Romania and Czech Republic share the lowest age-crime bracket alongside less violent crime than any other nationality, suggesting relevant questions for future research in order to understand the patterns and knowledge gaps of intra EU migrant offending.

Table 8: Crime type profiles of offenders by nationality for the year 2011-2012

Crime Type	2011	2011-12						
	England	IE	LV	LT	PL	RO	CZ	IT
Acquisitive	23%	33%	51%	47%	35%	66%	49%	30%
All Violence	30%	27%	20%	19%	29%	3%	10%	24%
Sexual Offences	2%	3%	1%	1%	2%	1%	3%	3%
Burglary	6%	7%	3%	3%	4%	6%	6%	2%
Drug offences	13%	5%	2%	2%	5%	0%	4%	10%
Criminal damage	8%	5%	4%	4%	6%	0%	3%	6%
Fraud & forgery	3%	3%	3%	4%	1%	6%	2%	6%
Robbery	3%	2%	1%	1%	1%	1%	3%	1%
Other	12%	15%	15%	18%	16%	16%	21%	19%

England shares Romania's lower peak age bracket (see figure 6) and presents contrasting crime type results. This led the research to explore the validity of the FOIA data being used and its comparability when analysing crime types. The 2011 FOI requests for the types of crime committed by the nationality inclusive 'England' offending population sought data for a sample three month period (January to March 2011) only as a result of resource and cost restrictions. Such a time restricted sample is therefore open to any seasonal crime type changes and may not be suitably comparative but sufficient to indicate potential questions.

Open access statistical crime data was obtained from the Office for National Statistics (ONS) in the UK for 2011 detailing counts of crime reported and recorded, but not necessarily detected, by Police forces where all recording of crime follows comprehensive recording rules as used by the UK Government Home Office.

Figure 9 portrays an apparently more comparable crime type profile than the 2011 FOIA data presented within figure 8, sharing the same peak as the foreign nationalities with lower levels of violent rather than acquisitive crime. However, it is important to recognise that the ONS data is an annual population sample of *all reported and recorded crime*, whereas the FOIA data obtained covers the number of offenders charged with an offence. Therefore, the ONS data cannot be used as a comparable data source against the foreign national FOIA data which is a measure of policing activity and the ability to detect crimes. The difference between the two data sets is significant with the FOIA for England producing higher levels of violent crime and the ONS data producing higher levels of acquisitive crime. The ONS data is still valuable to consider as it raises questions relating to why general offences of violence are better detected than acquisitive offences (shown in the higher levels of 'All Violence' in the FOIA data) in a non-Prüm signatory country in contrast to migrant nationalities.

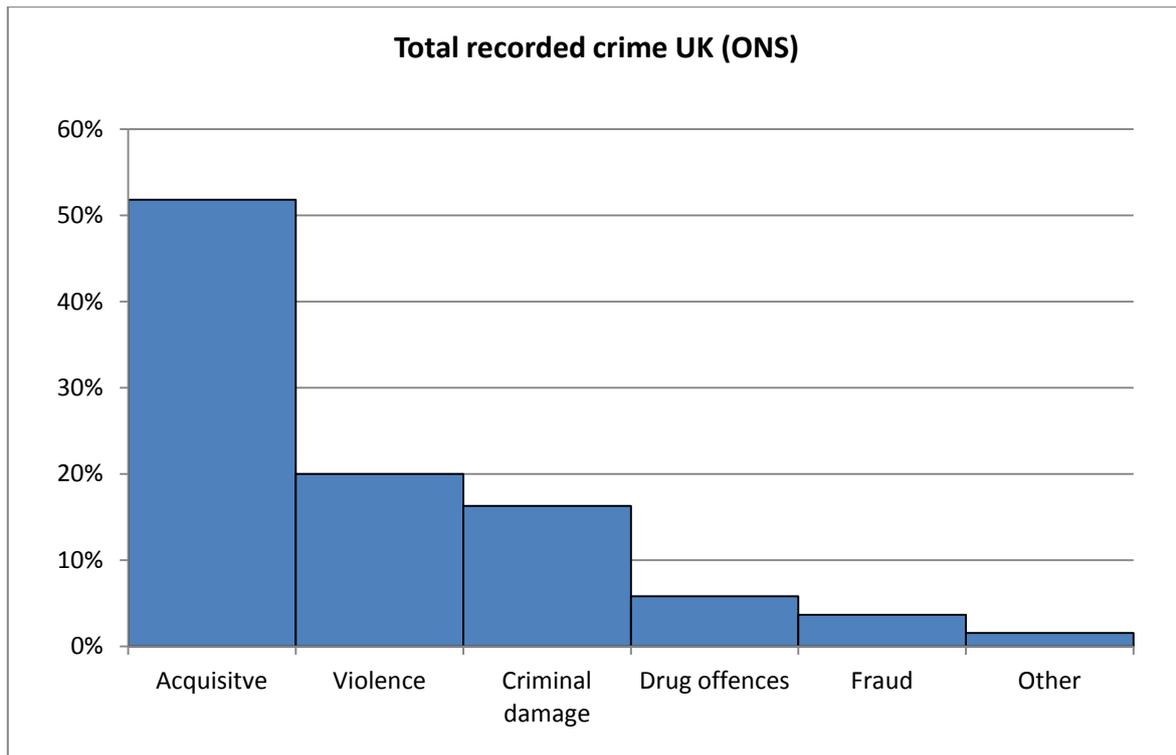


Figure 9: Individual crime type proportions of total recorded crime for all nationalities (2011).

Table 9 provides a breakdown of offence types aggregated into acquisitive or violent crime for the examined nationalities. Within this table categories have been adjusted accordingly to become inclusive of all violent or acquisitive crime with offences of robbery included in the Violence category as it is by nature a violently confrontational crime against the person.

Table 9: Acquisitive vs. Violent crime type % comparison chart

%	2011-12							2011
	RO	CZ	LV	LT	PL	IT	IE	
Crime Type								UK
Acquisitive	72%	55%	55%	51%	40%	31%	40%	29%
Violent	4%	13%	21%	20%	30%	25%	36%	33%
Difference	68%	42%	34%	31%	9%	6%	4%	-4%

Crime type profiles for each nationality were compared using a Chi Square test of independence based upon the hypothesis that the acquisitive and violent percentage scores by nationality are independent. The chi-square test of independence is used to test the null hypothesis that the frequency within cells in table 9 (Acquisitive and Violent offending) is

that which could be expected and table 10 provides the results. Where p values are <0.05 (95% confidence level) the alternative hypothesis that the observed proportions are independent and have not arisen by chance is accepted

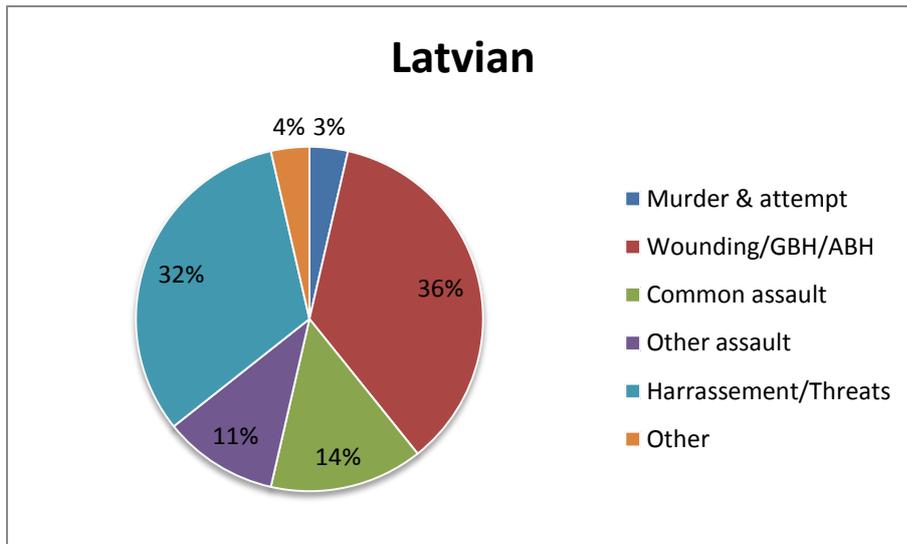
Table 10: Chi Square results for crime type (Acquisitive vs. Violent) profile comparisons

	CZ	IE	LV	LT	PL	RO	England	IT
CZ		<0.001	0.3152	0.2917	<0.05	<0.05	<0.001	<0.05
IE	<0.001		<0.05	<0.05	0.7034	<0.001	0.6077	0.8936
LV	0.3152	<0.05		0.9421	0.0794	<0.001	<0.05	0.0654
LT	0.2917	<0.05	0.9421		0.0996	<0.001	<0.05	0.0818
PL	<0.05	0.7034	0.0794	0.0996		<0.001	0.3098	0.984
RO	<0.05	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001
England	<0.001	0.6077	<0.05	<0.05	0.3098	<0.001		0.4551
IT	<0.05	0.8936	0.0654	0.0818	0.984	<0.001	0.4551	

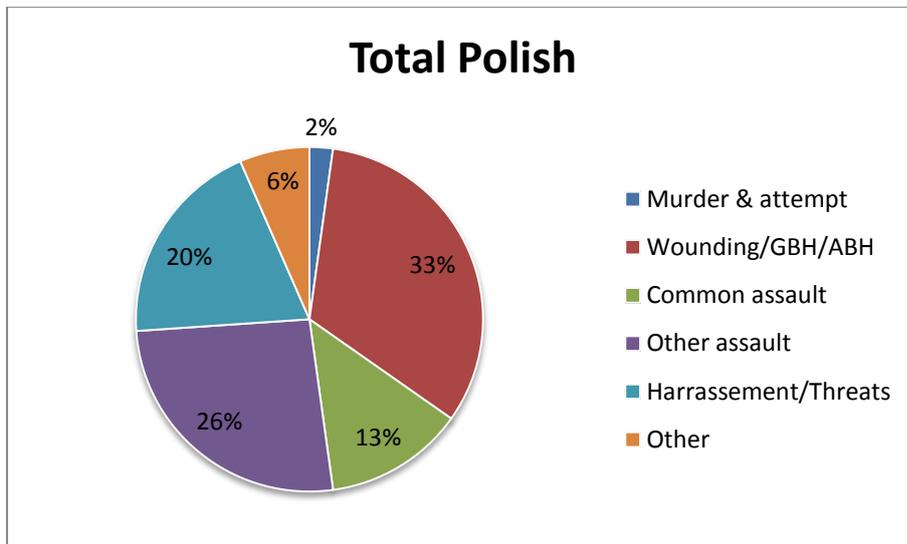
Romania is the only nationality to display independence from all other nationalities examined and overall the crime type analysis raises a number of issues given that the data examined represents the ability of the English Police forces to identify offenders and bring them to justice through the formal offence charging route. The very significant low proportion of detected violent Romanian offending seeks explanation although it has been previously suggested that immigrants are more prone to under-reporting, due to distrust, cultural attitudes and language barriers [122, 114]. Whilst potentially mitigating the low Romanian proportions this is a contentious issue with Papadopoulous (2013) arguing that immigrants do not under-report more than natives through victimisation survey research [183].

In terms of the acquisition of forensic evidence violent crime with injury is seen as an activity more likely to yield bio-informatic (DNA) data than most non confrontational acquisitive offences. Further breakdown of violent offending through a sample of Police Forces experiencing significantly high Standardised Location Quotients of offending is provided in Figure 10 with comparisons between Latvian, Polish and Romanian offending, the offence types of Murder (and attempt) with Wounding/Grievous Bodily Harm (GBH) and Actual Bodily Harm (ABH) being those most likely to yield forensic trace evidence. Here it can be seen that Romanian offending involves a notably smaller proportion of such serious injury violence than both Latvian and Polish offending.

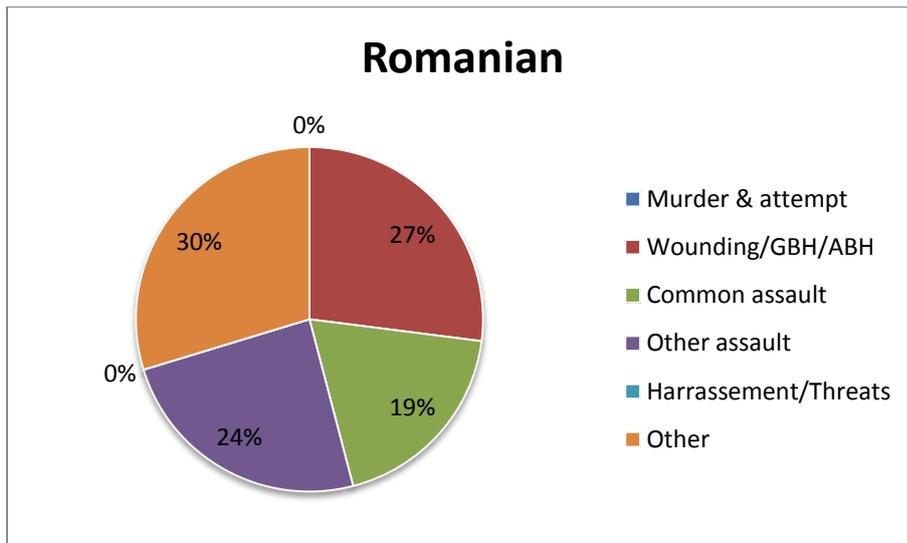
Figure 10: Data breakdown of violent offending by nationality in England.



Lincolnshire (2011) Police Only



Lincolnshire (2011) Police Only



Bedfordshire (2011+2012), Hertfordshire (2011+2012), Essex (2011+2012), Thames Valley (2012)

Analytical Model

Calling on only English offending data an analytical model was developed incorporating spatiality, age, gender and type of criminal activity pertinent to offending by inter-EU migrants. The model identified that overall, and as in part suggested by the limited available previous research findings, offending activity delineated by nationality should not be generalised or linked to known national profiles as a default position.

Spatial aspects:

Within England offending by nationality grouping displayed significant spatial diversity ranging from focus on areal units (Latvian and Lithuanian offending limited to East Coast areas) to significant diversity at the meso scale (Polish with very limited areal unit focus). Spatial analysis reveals potential impact on the justice and social systems at a localised level where some areas are seen to experience significantly higher rates of offending than others at levels likely to require greater resource provision for victims, offenders and the general population. From the Prüm perspective it can be seen as identifying that spatial knowledge of offending by areal units may serve to identify areas/areas of responsibility that may receive a greater benefit from bio-informatic data sharing than others.

Age-gender profiles

Within England data confirmed that generalising the age crime profile of national offending groups is contrary to the quantitative results reported. There are significant differences between the age-gender offending profiles of offenders within and between national groups which may be linked to the age profile of migration but, with further research, may also inform the knowledge base on criminal careers of inter-EU migrant offenders and again be indicative of the potential impact of the Prüm directive. Romanian offending displayed a lower age profile than other nationalities and high volumes of acquisitive crime, potentially suggesting through previously published works that offenders from that group may be at early stages of criminal career development. In contrast Latvian and Lithuanian offenders have a higher peak offending age together with significantly higher volumes of violent crime questioning whether those offending populations in England have greater developed criminal careers and therefore present a greater chance of being apparent in their national DNA databases.

Crime types

Similarly the crime type profiles of nationalities appear to differ and should not be generalised. The vast majority of offending was found to be relatively low level acquisitive crime such as theft and particularly theft from shops. Most notable was the very low proportion of violent crime committed by Romanians which may be indicative of low reporting levels within the Romanian community and could with further research raise a number of important questions such as reporting/knowledge of issues of domestic related violence and abuse.

Relating back to Prüm the analytical model has the potential to provide core context provision on its application and development, particularly through the identification of areas and methods that could be further investigated to establish a detailed investigation of quantitative evaluation of impact. It also strongly suggests that preventative methods and particularly information to be provided in order to impact deterrence needs to be tailored to national groupings as opposed to a generalised 'all inclusive' approach.

The EU

In parallel to the development of an analytical model to inform context provision work was undertaken to establish the transferability of such a model to partner member states; seeking knowledge on data availability, integrity, relevance and usefulness. EU member states are complex in structure, geography and political history (including regulation of migration) (see table 11 for some demographic data). For each of these member states a number of key data sets were identified and explored to identify the smallest geographic scale at which analysis of crime rates could be calculated and provide suitable areal units for analysis and presentation.

Data was collected on population, nationality of foreigners in the population, counts of crime, counts of foreign offenders detected/charged/convicted, and where possible the nationality of these foreign offenders for a number of EU member states. It was found that crime data is not easily accessible for many EU member states (19 out of 28 member states could not provide data relating to foreign and native offender at a geographic scale lower than country level) [150].

In order to provide some comparability, Eurostat NUTS (Nomenclature of Territorial Units for Statistics) classification system was utilised [151]. NUTS classifications were introduced as a single, coherent system for dividing up the expansive EU territory to harmonise collection, transmission and publication of statistics. In order to be comparable, the geographical areas relating to the statistics need to be similar in terms of population and according to Eurostat classifications ought to cover the following population thresholds:

- NUTS 1: 3 – 7 million people
- NUTS 2: 800,000 – 3 million people
- NUTS 3: 150,000 – 300,000 people.

However, despite the aim of ensuring regions of comparable size, each NUTS level still contains regions which differ greatly in terms of population to the given threshold.

Table 11: Demographic data of the EU28 member states, including size, population and crime rate.

Country (main data source)	Size (km ²)	Population (31.12.2012)	Number of offences (2012)	Crime rate (per 10,000 pop)
EU15				
Austria (<i>Statistik Austria</i>)	83,900	8,401,940	548,027	652
Belgium (<i>Statbel</i>)	30,500	11,099,554	1,035,836	933
Denmark (<i>Danmarks Statistik</i>)	42,900	5,227,012	154,494	296
Finland (<i>Statistics Finland</i>)	338,400	5,426,674	425,421	784
France (<i>INSEE</i>)	454,000	62,765,235	3,327,853	530
Germany (<i>DESTASIS & BKA</i>)	357,000	80,523,746	5,997,040	745
Greece (<i>EL.STAT</i>)	131,900	10,816,286	194,244	180
Ireland (<i>CSO</i>)	84,400	4,453,276	245,425	551
Italy (<i>ISTAT</i>)	301,338	59,685,227	933,895	156
Luxembourg (<i>STATEC</i>)	2,600	537,039	37,639	701
Netherlands (<i>CBS</i>)	41,500	16,856,620	1,140,430	677
Portugal (<i>INE</i>)	92,200	10,427,301	404,813	388
Spain (<i>INE</i>)	504,600	46,591,857	275,130	59
Sweden (<i>SCB</i>)	450,000	9,555,893	1,402,588	1,468
A10				
Cyprus (<i>Statistical Service of Cyprus</i>)	9,300	1,117,000	10,610 (2010 data)	95
Czech Republic (<i>CZSO</i>)	78,900	10,513,209	304,528	290
Estonia (<i>Statistics Estonia</i>)	45,200	1,325,217	40,816	308
Hungary (<i>KSH</i>)	93,000	9,908,798	472,015	476
Latvia (<i>CSB</i>)	64,600	2,044,813	49,905	244
Lithuania (<i>LSD</i>)	65,300	1,989,268	42,884	216
Malta (<i>NSO</i>)	316	421,364	15,622	371
Poland (<i>GUS</i>)	312,700	38,495,659	1,119,803	291
Slovakia (<i>SU</i>)	49,000	5,415,949	47,561	88
Slovenia (<i>SU</i>)	20,7000	2,055,496	16,025	78
A2				
Bulgaria (<i>National Statistical Institute</i>)	111,000	7,284,552	40,400	55
Romania (<i>INSSE</i>)	238,400	21,354,396	292,682 (2011 data)	137
Croatia (<i>DZS</i>)	56,600	4,284,889	110,068	257

Analysis of the data pertaining to the calendar year 2012 identified limited availability of data across the EU member states relating to offending by foreign nationals at a number of different geographic scales. Appendix 4 provides a detailed breakdown of the level of data availability for each EU member state providing geographic as well as demographic detail. Over all it was found that data could only be obtained at the following levels:

At the macro scale (country level):

- 17 out of 28 EU member states published data on foreign offending (e.g. a division of foreign and native offenders)
 - o Only 11 were able to provide a breakdown of nationality of offenders.

At the meso (in-country) scale:

- 8 out of 28 EU member states published data on foreign offending
 - o 3 at NUTS 2 level
 - o 5 at NUTS 3 level
- Only 3 were able to provide a breakdown data of nationality of offenders.

Overall, data availability from EU15 member states was considered to be relatively poor. Greece, Ireland and Luxembourg were not studied in detail due to lack of data availability (Greece and Ireland) or the small geographic nature of the member state (Luxembourg) which provides data only at a single administrative (country) level. Similarly, Cyprus and Malta were also omitted from analysis due to their small size. It is well documented that southern European countries (e.g. Malta and the islands of Italy) have a much more pressing migration problem from third country nationals (e.g. African nationals) compared to EU nationals. Therefore, it is expected that their intra-EU offending data would have limited impact on the overall EU picture.

Spatial Clustering

In order to begin to analyse the geographic diversity of foreign offenders, Location Quotient mapping of EU offending identified France and its bordering nations (Spain, Italy, Germany, and Switzerland) as a significant cluster of countries for which meso level data was available and illustrated interesting trends worth exploring further; an apparent clustering of foreign offending in border regions (see figure 11). Table 12 illustrates the relevant LQ values identified in regions that border with another member state.

Table 12: LQs analysis of select EU member states which identify increased border activity.

Country	Name of region	Country region borders with	LQ value
France	Pyrénées-Orientales	Spain	LQ > 1.7
	Pyrénées-Atlantiques Haute Garone		LQ > 1.1
	Savoie Alpes-Maritimes	Italy	LQ > 1.7
	Haute-Savoie	Italy/Switzerland	LQ > 1.1
Spain	Cataluña Aragón Navarra País Vasco La Rioja	France	LQ > 1.1
Italy	Liguria Piemonte Valle d'Aosta Lombardia	France/Switzerland	LQ > 1.1
	Trentino Alto Adige Veneto Friuli Venezia Giulia	Austria/Slovenia	LQ > 1.1
Germany	Oberbayern	Austria	LQ > 1.4
	Freiburg Karlsruhe	France	LQ > 1.1
	Trier	Luxembourg	LQ > 1.4
	Trier Köln	Belgium	LQ > 1.1
	Düsseldorf	Netherlands	LQ > 1.1

In figure 11, France demonstrates increased border activities with Spain and Italy, regions which are major tourist regions and contain commercial routes to neighbouring countries. The departments of Pas de Calais and Paris display high LQ values (> 1.7) for foreign offenders, Nord-Pas de Calais has low LQ values for foreign population but high values for foreign offenders in relation to the surrounding departments. Savoie, Paris and Pyrénées-Orientales are also over-represented (LQ>1.4) for crime rate in the population.

Aokia and Todo (2009) looked at the relationship between migration and crime in France, finding conflicting results [103]. Initially, it appears that crime rates are positively correlated with the share of immigrants in the population (significant to 0.05); however, if controlled for economic circumstances this correlation becomes insignificant, “immigrants are not *‘inherently’* more likely to commit crimes than the rest of the population” [103]. The data obtained for this research indicates that departments that are high for foreign population also have some overlap with areas that illustrate high crime rates (Haute-Savoie, Alpes Maritimes, Paris and surrounding areas).

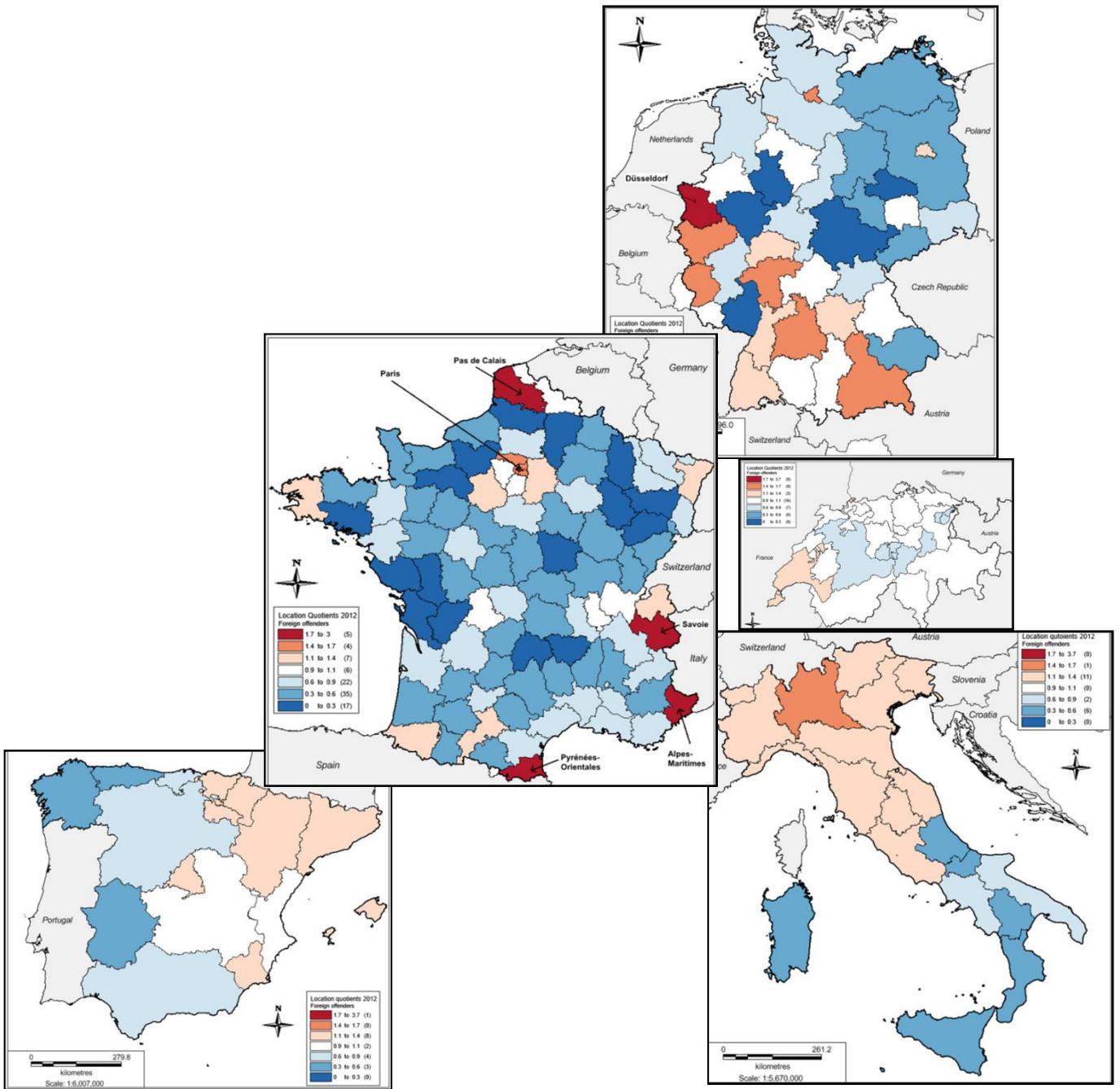


Figure 11: Location quotients for foreign offending in (from clockwise) Germany, Switzerland, Italy, Spain and France, illustrating border clustering.

In Spain bordering regions with France equally illustrate high LQs for foreign offending. It was not possible to determine the nationality of the foreign offenders within those regions (whether these are French nationals committing crime in Spain or other foreign nationals) as this data was not available. The Ministry of Interior [152] does indicate that French nationals are the fourth largest EU nationality arrested in Spain (preceded by Romanians, Bulgarians and Portuguese). LQs for foreign and native offenders could only be calculated at regional level (NUTS2), and did not indicate any significant results. Northern (Galicia, Asturias and Cantabria) and western regions (Extremadura and Andalucía) had high LQs for native offenders (LQ<1.4), and the region of Cataluña and Madrid had low LQs (LQ<0.9). The regions bordering with France to the north-west of Spain (Cataluña, Aragón, Navarra, País Vasco and La Rioja) indicated a slight over-representation of foreign offenders (LQ<1.4), however regions bordering with Portugal (Galicia and Extremadura) showed the opposite (LQ<0.6).

Marcu (2012) estimated that the increased population from former socialist states living in Spain was mainly due to the huge arrival of Romanian immigrants, for whom Spain and Italy have been the main destinations [153]. At the start of 2008, the Romanian population represented 64% of all the groups coming from CEE and 13% of all the foreign groups living in Spain. Romanians also had the highest year-on-year growth rate for all foreign nationals originating from the former socialist bloc, followed by Bulgarian immigrants.

Arbach-Lucioni et al. (2014) analysed the rate of crimes committed by Spanish and foreign nationals; assessing the socio-demographic, criminal history and imprisonment-related factors for 1,574 convicted males (657 foreigners, 917 natives). Foreign nationals were found to originate from 63 countries, most commonly Morocco (12.5%), Colombia (3.2%), Ecuador (3.0%), and Romania (2.3%) [154]. The authors found no differences in the rate of violent conviction, however differences in the distribution of risk factors in each nationality group were observed (foreigners were younger and had lower economic resources and lower social support) [154].

Buonanno and Montolio (2008) studied the socio-economic and demographic determinants of property crimes in 46 out of 52 Spanish provinces between 1993 and 1999, considering amongst other factors the crime rate of foreign nationals [155]. They found that property crime and the total crime appear to be significantly correlated to the fraction of foreigners in the population. This was found to not be the case for crimes against the person. These results suggest that provinces with a higher fraction of immigrants suffer more criminal activities of a specific nature. However, this may be due to the fact that the opportunity cost of crime for a foreigner is lower than for natives because they are normally paid much lower wages or have temporary (or illegal) jobs [155].

This idea was also considered by Westbrook (2013) who analysed the level of immigration and crime between 2003 and 2007 in Catalonia [109]. She found that the majority of

immigrants were male, between 18-35 years old (which criminologists claim have the highest incidence of criminal delinquency), with relatively volatile economic situations (high unemployment, lower wages, etc.). For each year examined, she found a higher crime rate for all immigrant populations in Catalonia as compared to that of natives [109]. A statistically significant positive correlation between migration and crime for three (out of 37) nationalities was found indicating that *“certain immigrant groups are more strongly correlated with higher crime rates than others”*, even after their age, gender and GDP demographic differences were controlled for [109].

At the end of 2012, the Ministry of Interior (2013) found that the number of Romanian nationals in Spanish prisons represented 10.2% of the total number of foreigners detained and the highest percentage of citizens from any EU member state (46.9% of the total) [152]. According to Ilie (2014), Moroccans (26.4%), Colombians (11%) and Romanians (10.2%) make up the majority of total foreign prisoners detained in Spanish prisons for all nationalities [156].

In Italy, high LQs for foreign offending were found in the north ($LQ > 1.1$) and low LQ values were found in the south ($LQ < 0.6$). LQs for foreign population illustrate some clustering around the centre of Italy. The Italian National Institute of Statistics (ISTAT) [157] indicates that these regions are consistently high for: Romanian, Polish, Bulgarian, German, French and British nationals. Location quotients for crime rates by foreign offenders could only be carried out at the regional level (NUTS2). Foreign offenders were slightly under-represented in the south of Italy but slightly over-represented in the north. The highest region of over-representation is the region containing Milan in the north ($LQ > 1.4$). Sardinia and Sicily are significantly under-represented ($LQ < 0.6$).

Immigrant crime is a relatively recent phenomenon in Italy, since historically it was predominantly an emigration rather than immigrant nation, and can be regarded primarily as an exporter of criminality. Italian criminologists are divided on the question of whether foreigners are particularly likely to be offenders [158]. It is undeniable that foreigners are more represented in the official statistics but it is also true that they are more easily recognizable and that they tend to commit more conventional crimes, which are, in turn, easier to detect.

ISTAT indicates that foreigners were responsible for 32% of all crimes in Italy in 2011, and are especially active in theft and burglaries [157]. Becucci and Massari (2003) found that more than 60% of all reported offenders were foreign in the metropolitan areas of the central and northern regions (around Turin, Milan, Bologna and Florence) [159].

Bianchi et al. (2012), using police administrative data, empirically examined the relationship between crime and immigration across Italian provinces from 1990 to 2003 [104]. The authors found a positive correlation between the size of an immigrant population and the

incidence of property crimes and the overall crime rate. However, the relationship disappears when immigration is properly instrumented, except for a significant effect on robberies. The effect on the overall crime rate is negligible since robberies are only a small fraction (1.5 %) of total criminal offences. They conclude that “*neither the overall crime rate nor the number of most types of criminal offence are significantly related to the size of the immigrant population*”, but do raise questions concerning the perception of the crime-migration concept [104].

In Germany, spatial clustering of foreign offenders is skewed towards the western and southern parts of the country, with low LQ values in the north-east. Evident from figure 11 is an apparent division between East and West Germany, with the west illustrating relative over-representation and the east relative under-representation. Considered from an EU perspective, bordering regions with traditional EU15 countries to the west display high LQs, but bordering regions with A8 member states to the east display the opposite. It is unclear of the reasons behind this at present and would require further quantitative data collection.

Most people with a migration background come to Germany from Turkey (17.6%), followed by Poland (9.6%), Russia (7.5%) and Italy (4.9%); 1.4 million (Spät-) Aussiedler have come from the successor states of the former Soviet Union – especially from the Russian Federation (576,000) and Kazakhstan (553,000) [160]. Immigrants settle in major towns and cities such as Düsseldorf, Köln, Frankfurt and München (LQ>1.7). Municipalities such as Duisburg, Düsseldorf, Frankfurt and München also contain major transportation hubs (airports, seaports, harbours, railway networks) for commerce, industry and tourism and consequently attract a lot of people.

Previous work looking at overall crime rates between East and West Germany found the East to have higher crime rates [161]. Jones (2008) states that it is “*unclear [...] if this difference relates to residents and visitors in the different regions or to political differences between areas*” [161]. Entorf and Spengler (2008) found a steady upward trend in violent crimes (specifically attributed to robbery and assault rather than homicide and rape) in both East and West Germany [162]. Importantly, they provided that contrary to popular perception violent crime rates were not found to be higher in East Germany than in West Germany [162].

Piopiunik and Ruhose (2014) explored the “*exogenous allocation of ethnic German immigrants across regions*” of Germany and found a correlation between immigration and the overall crime rate [163]. They found the inflow of one ethnic German immigrant per 1,000 inhabitants increased the total crime by 0.88%. Effects which were found to vary by crime type; immigration had a strong impact on burglary and property damage, but no effect on street crime [163]. These effects were also dependent on the socio-economic

conditions of the receiving region and the impact of ethnic German immigration crime was stronger in regions with a high pre-existing crime rate [163].

Comparative offending data was not available in Belgium. Personal communication with colleagues indicated that it was difficult to obtain data on crime and criminality for researchers working outside of the organisations that collate and process these [164]. Even Belgian criminologists and researchers do not easily get access to this information. Police do not publish this information, nor make it accessible for researchers in its raw format. Table 13 provides some information of the top ten registered nationalities (where this information is known) of suspects for given crime types in the form of a percentage [165]. It also provides the total number of crimes committed in 2012 by region. Although it was only possible to obtain data for a limited number of EU nationalities, it becomes evident that foreign offending does occur in Belgium and should be of concern to policy makers [165].

Table 13: Crimes committed in Belgium for which the nationality of the suspect is known (top 9 registered nationalities given in the form of a percentage for Belgium as a whole and for each of the three regions within Belgium). (Data courtesy of the Federal Police Belgium)

		Theft & extortion	Damage to property	Crimes against the physical integrity	Fraud	Drugs
Belgium						
	Total (numbers)	414,564	99,717	79,320	40,248	47,269
1	Belgian	62.5%	83.1%	80.2%	66.2%	78.0%
2	French	3.2%	3.2%	2.3%	4.2%	4.1%
3	Dutch	2.3%	2.0%	1.6%	4.7%	3.4%
4	Romanian	5.3%	0.5%	0.7%	3.4%	
5	Polish	2.0%	0.9%	0.9%	1.2%	0.6%
6	Italian	1.3%	1.2%	1.5%	1.6%	0.9%
7	Bulgarian	1.0%				
8	Spanish		0.5%			0.5%
9	German		0.4%			
Brussels Capital Region						
	Total (numbers)	84,293	11,464	10,167	5,249	7,330
1	Belgian	41.7%	60.4%	59.5%	50.2%	68.2%
2	Romanian	8.9%	2.5%	2.6%	5.7%	
3	French	3.4%	8.2%	3.7%	5.4%	3.9%
4	Polish	2.5%	2.5%	2.8%	1.5%	1.5%
5	Dutch		2.1%		1.8%	
6	Bulgarian	1.5%				
7	Italian	1.7%	1.2%	1.5%	1.7%	0.9%
8	Portuguese		1.3%	1.5%	1.8%	1.0%
9	Czech		1.0%			

Flanders						
	Total (numbers)	199,085	51,568	37,662	22,475	26,995
1	Belgian	61.7%	84.6%	81.7%	68.1%	80.1%
2	Dutch	3.9%	3.2%	2.8%	7.8%	5.2%
3	Romanian	5.2%	0.4%	0.5%	3.2%	
4	French	1.8%	1.3%	0.8%	2.5%	3.2%
5	British				1.6%	
6	Polish	2.6%	1.2%	1.1%	1.6%	0.7%
7	Bulgarian	1.3%			0.9%	0.4%
8	Italian		0.5%	0.5%		0.5%
9	Spanish		0.5%			0.5%
Wallonia						
	Total (numbers)	131,186	36,685	31,491	12,524	12,944
1	Belgian	70.6%	86.8%	84.3%	70.3%	79.2%
2	French	5.9%	4.7%	4.1%	6.8%	6.2%
3	Italian	2.5%	2.4%	2.9%	3.4%	1.8%
4	Romanian	3.7%		0.4%	2.8%	
5	Dutch		0.3%			1.0%
6	Luxemburgish					0.5%
7	Polish				0.5%	
8	Portuguese		0.2%			0.5%
9	Spanish		0.4%	0.4%	0.5%	

Overall foreigners make up approximately 11% of the population, with the Brussels Capital Region containing by far the highest percentage of foreigners (33%, Flanders – 7%, Wallonia – 10%). EU migrants make 67% of the foreign population, with Italy (14.5%), the Netherlands (12.3%) and France (13%) making up the largest proportion of foreigners in total.

The foreign population tends to be over-represented in the border regions – predominantly along the border with the Netherlands and Germany. Antwerp, the second most populous city in Belgium contains one of the biggest ports in the world as well as a busy international airport. Statbel Belgium [166] indicates that approximately 60% of residents of Antwerp have a migrant background. The Flemish municipalities close to the Dutch border experience a lot of cross border commuting for work where Dutch people live in the border regions (e.g. Hoogstraten, Lanaken) but work in the Netherlands and consequently a significant percentage of foreigners living in these border regions are Dutch .

Data available from Austria was only able to determine the number of foreigners convicted per region, which was not comparable to offending data analysed for all the other countries. The Netherlands also provided limited data relating to crime by foreign nationals. No meso scale data was available; however at country level Statistics Netherlands [167] identifies

German nationals as the second highest offending EU nationality (after Romanian). Again this provides evidence of foreign offending, but the distribution cannot be clarified.

The Netherlands provided limited detailed data relating to crime by foreign nationals. Foreigners in the population seem to aggregate around major towns and cities in the Randstad conurbation – Amsterdam, Rotterdam, Utrecht and The Hague, one of the most important economic and densely populated areas in the northwest of Europe (LQ>1.4). These four cities have received considerable attention due to a number of social and economic problems including rising unemployment and deprivation of certain urban environments. Statistics Netherlands (CBS) indicates that currently nearly 60% of immigrants settle in municipalities with a population over 100,000 (currently 27 large municipalities), and Amsterdam has the highest proportion of immigrants with a non-western background [168].

In 2012, four in ten immigrants to the Netherlands originated from another EU country with a large majority coming from Poland [169], and a rise from Southern European countries such as Spain and Italy (potentially due to the effect of the economic crisis in these countries) [167]. Immigration from CEE member states remained steady; however emigration of these groups rose. Emigration of Dutch nationals to Belgium and Germany remains steady; the Mediterranean and France was found to be popular with pensioners as destination countries of Dutch natives [170]. Most immigrants of Polish nationality come to the Netherlands to find work via agencies in construction and horticulture industries located in the Westland area and the province of Brabant and the tulip growing areas. Immigrants employed in short-term work are not required to register as residents; therefore these will not be recorded in official statistics. Statistics Netherlands also found that around half of Polish immigrants who come to the Netherlands leave within a ten year period [171].

The highest crime rates by population were found in the municipalities of Amsterdam and Eindhoven (LQ>1.4). Police statistical data on crime rates found that Eindhoven has had the second highest crime rate (per 1,000 populations) in the Netherlands after Amsterdam for the past two years. Amsterdam also demonstrated twice the national average for registered thefts (87 per 1,000 residents), followed by Eindhoven (77/1,000 residents) and Maastricht (71/1,000 residents) [172].

Data from the A8 member states was mixed. Lithuania, Poland and Slovakia did not break down their data into foreign or native population, nor did they supply data on foreign and native offenders. Therefore they are not included in this analysis section. Cyprus and Malta only collect data at a single administrative (country) level due to their small geographic size, and are also omitted from the analysis. None of the remaining countries – the Czech Republic, Estonia, Hungary, Latvia or Slovenia – published data on foreign offending, and consequently the LQs for crime by population could be calculated.

In the Czech Republic, the largest group of foreign nationals were Ukraine, Slovak, Vietnamese, Russian, Polish and Germans [173]. EU nationals make up 36.8% of all foreigners in the Czech Republic; predominantly originating from Slovakia (19.7%), Poland (4.4%), Germany (3.9%), Bulgaria (1.9), Romania (1.3%) and the UK (1.2%) [173]. No data was available which indicated the breakdown of foreign offenders, and only LQs for crime by population could be calculated and indicate that the region of Prague and Ostrava-mesto have high values ($LQ > 1.7$). Kamenický (2013) looked at the structure and intensity of crime at regional level in the Czech Republic [174]. They found above-average crime rates in most regional cities (where Prague and Ostrava at the highest crime levels) [174]. Broken down by crime type they found that thefts and economic crimes were high in Prague, and violent crime and burglaries were higher towards the north of the Czech Republic, in regions bordering with Germany and Poland [174].

LQs for the foreign population in Estonia illustrated that the county of Ida-Viru is strongly over-represented ($LQ > 1.7$) and the remainder of the country is under-represented for foreign populations. By ethnic origin, 72.5% of the population of Ida-Viru were Russians, 19.2% Estonians, 2.3% Ukrainians, 2.3% Belarusians and 0.9% Finish [175]. This is dramatically different from the rest of Estonia, where most counties are over 69.2% ethnic Estonians. National statistics in Estonia do not provide nationality details of offenders, nor do they provide details of native and foreign offenders.

LQs for foreign population in Hungary illustrate a diverse pattern. Budapest was found to highly over-represented for foreign population ($LQ > 1.7$) and Borsod-Abaúj-Zemplén significantly under-represented ($LQ < 0.3$). According to the 2011 Census, 80% of the population of Budapest was Hungarian, 1.2% Roma, 1.2% German, 0.4% Romanian and 0.1% Polish [176]. Hungary has the unique geo-economic advantage of occupying the middle of Europe in the midst of the important axis of the Danube as well as the Baltic-Aegean axis. As an effect, crime syndicates have been found to use Hungary as a major transit ground for their pan-European operations and as a base for coordinating their cells in other regions. Traffickers move illicit cargo by road and rail routes easily, e.g. tobacco and women from the Ukraine are trafficked towards Austria, and illegal immigrants are transferred from, and weapons and drugs are being imported from Croatia and Serbia. The local criminal networks in Hungary and Budapest in particular are formed by former members of security forces and pre-existing black marketers who maintained contacts with the local authorities. This has led to a widespread corruption in the local security forces and the coexistence of former and present executives with links to members of organized crime. Crime by population illustrates that the regions of Budapest and Fejér in the centre of Hungary are significantly over represented ($LQ > 1.4$). Twenty-five percent of all crimes recorded in Hungary occur in Budapest.

Data from the Romania, Bulgaria and Croatia mirrored that available from the A8 member states. None of these countries published data on foreign and native offending, and consequently on the LQCs for crime by population could be calculated.

LQs for foreign population in Romania illustrate a diverse pattern, which identified the regions of Bucharest, Iasi, Suceava and Vaslui as significantly over represented ($LQ > 1.7$). Significant ethnic groups are Roma Gypsies, Hungarians, Jews, Turks, Chinese and Germans. Most counties in Romania were identified to be over 95% ethnic Romanians, except for Covasna, where 73.7% of the population is Hungarian, 22% Romanian, and 4.1% Roma [177].

Researchers have mapped the crime rate in every county of Romania (per 100,000 populations) and identified that the most dangerous counties are Hunedoara, Alba and Gorj [178]. Monalche et al. (2011) found that the regions more economically developed displayed a lower crime rate [178]. Romania did not break down offenders according to nationality, or native and foreign offenders. Consequently only maps of crime by population could be produced which identified the regions of Alba, Braila, Galati, Hunedoara, Mehedinti and Vrancea as significantly over-represented ($LQ > 1.4$). Bucharest's crime rate is rather low in comparison to other European capital cities, with the number of total offenses declining by 7% between 2012 and 2013 [179]. Although violent crimes fell by 13% in 2013 compared to 2012, there were 19 recorded murders. Petty crime is more common, particularly in the form of pick pocketing, which occurs mainly on the city's public transport network. Theft was reduced by 13.6% in 2013 compared to 2012. Levels of crime are higher in the southern districts of the city, particularly in Ferentari, a socially disadvantaged area.

LQs for foreign population in Bulgaria illustrate a diverse pattern. Haskovo and Montana have a high concentration of Turks, Bulgarians and Roma gypsies within their city limits. Bulgaria did not break down offenders according to nationality, or native and foreign offenders. Consequently only maps of crime by population could be produced which identified the regions of Blagoevgrad, Haskovo, Montana, Pleven, Sliven, Stara Zagora, Vratsa and Yambol as significantly over-represented ($LQ > 1.4$) and the region of Sofia as significantly under-represented ($LQ < 0.3$). Varna is known to be the main hub for Bulgarian organized crime. Some sectors of the economy, including gambling, corporate security, tourism, real estate, and professional sports, are believed to be controlled in part by business groups with links to Communist-era secret services or the military [180].

Bulgarian organised crime groups are involved in a wide range of activities, including drug trafficking, cigarette smuggling, human trafficking, prostitution, illicit antiquities trafficking, extortion and the arms trade [181]. They appear to have connections with the Russian Mafia, Serbian Mafia, and the Italian Cosa Nostra. Bulgaria is a source and, to a lesser extent, a transit and destination country for women and children who are subjected to

trafficking in persons, specifically forced prostitution and men, women, and children subjected to conditions of forced labour.

Brücker et al. (2009) identified a strong regional concentration of migrants in EU15 member states [33]. Migrants cluster in city regions, particularly capital city regions, on the French and Spanish Mediterranean coastal regions and EU15 central European regions. Jones (2008) looked at the geographic distribution of crime in Germany, and found that large, transitional urban areas (such as Berlin and Bremen) experienced higher crime rates [161]. According to the 2006 European labour Force Survey, Ile de France had the largest concentration of migrants in Europe (5.7%), followed by London (3%), Catalonia and Madrid (2.7%) [33]. The largest concentration of A8 migrants was identified to be Estonian migrants in southern Finland (approx. 40% of Estonian migrants lived here). Cross-border migration was found to be a strong influence at the German-French, French-Belgian, Austrian-German, and the Czech-Slovakian border, suggesting an influence in cross-border commuting between countries with a common language [33].

Some spatial analysis of crime by foreign nationals could be carried out across EU member states, which identified border regions as zones of greater activity. However, this data was limited to the categorisations of 'foreign' or 'native' offenders and did not provide a breakdown of nationality at a meso level (regional). Consequently it was not possible to determine whether EU or non EU-nationals were found to be offending in border regions, and whether the border activity was being committed by other bordering nationalities or by individuals originating from further away (e.g. itinerant travelling groups).

The finding of increased border activity relate to work carried out by other project partners who utilised the Prüm Treaty to develop a cartography of DNA hits between the Netherlands and the EU, establishing transnational spatial patterns of offending predominantly indicating high rates of activities in border regions [182]. This may provide important intelligence for regional police forces to focus resources on the collection of body fluids at crime scenes to improve potential Prüm hits.

Foreign offending

In order to begin to test the English model, information relating to nationality of foreign offending was collected. Openly published data for 2012 was only available for ten (out of 28) EU member states – Austria, Czech Republic, Denmark, England, Germany, Italy, the Netherlands, Poland, Slovakia and Spain – relating to rates and nationality of foreign offenders (see table 14). Data for these countries was only available at the macro level, and consequently no spatial clustering of intra-regional crime patterns could be determined.

Table 14: Foreign offenders by nationality as percentage of total crime (2012)

Foreign offenders	As percentage of total crime																					
	Austria		Czech Republic		Denmark		Germany		Italy		Netherlands		Poland		Slovakia		England					
AT			150	0.06%	97	0.02%	5,283	0.09%	275	0.01%	210	0.02%	2	0.00%	135	0.15%	49	0.00%				
BE	12	0.00%	9	0.00%	75	0.01%	1,853	0.03%	392	0.01%	3,060	0.28%	8	0.00%	14	0.02%	115	0.00%				
BG	263	0.04%	597	0.22%	660	0.12%	13,347	0.22%	4,281	0.14%	1,540	0.14%	108	0.01%	49	0.05%	469	0.01%				
HR	391	0.07%	87	0.00%	107	0.02%	7,067	0.12%	1,929	0.05%	no data	10	0.00%	22	0.02%	27	0.00%					
CY	3	0.00%	0	0%	no data	34	0.00%	8	0.00%	no data	no data	4	0.00%	266	0.01%							
CZ	208	0.04%			85	0.02%	4,550	0.08%	528	0.02%	440	0.04%	98	0.01%	987	1.06%	936	0.03%				
DK	4	0.00%	1	0%			867	0.01%	33	0.00%	80	0.01%	4	0.00%	12	0.01%	50	0.00%				
EE	9	0.00%	5	0.00%	96	0.02%	526	0.01%	60	0.00%	no data	7	0.00%	no data	182	0.01%						
FI	2	0.00%	0	0%	201	0.04%	261	0.00%	29	0.00%	60	0.01%	1	0.00%	no data	53	0.00%					
FR	27	0.01%	29	0.01%	326	0.06%	7,566	0.13%	2,236	0.07%	1,600	0.15%	27	0.00%	40	0.04%	734	0.02%				
DE	815	0.15%	359	0.13%	1,874	0.35%			2,030	0.07%	4,920	0.45%	112	0.01%	113	0.12%	319	0.01%				
GR	21	0.00%	35	0.01%	148	0.03%	9,547	0.16%	278	0.01%	no data	7	0.00%	16	0.02%	87	0.00%					
HU	624	0.11%	40	0.02%	328	0.06%	4,226	0.07%	566	0.02%	600	0.06%	11	0.00%	394	0.42%	421	0.01%				
IE	0	0.00%	7	0.00%	111	0.02%	438	0.01%	169	0.01%	260	0.02%	8	0.00%	9	0.01%	2,883	0.09%				
IT	98	0.02%	85	0.03%	482	0.09%	22,618	0.38%			1,100	0.10%	22	0.00%	97	0.10%	910	0.03%				
LV	25	0.01%	54	0.02%	458	0.09%	2,550	0.04%	242	0.01%	no data	38	0.00%	no data	2,243	0.07%						
LT	35	0.01%	86	0.03%	1,108	0.21%	4,451	0.07%	879	0.03%	no data	190	0.02%	3	0.00%	4,924	0.15%					
LU	0	0	no data	no data	554	0.01%	14	0.00%	no data	no data	no data	no data	2	0.00%	2	0.00%						
NL	55	0.01%	48	0.02%	639	0.12%	6,940	0.12%	292	0.01%		26	0.00%	34	0.04%	430	0.01%					
MT	0	0	no data	no data	16	0.00%	27	0.00%	no data	no data	no data	no data	no data	31	0.00%							
PO	399	0.07%	880	0.33%	3,918	0.73%	37,497	0.63%	3,300	0.10%	7,130	0.66%		284	0.31%	8,326	0.25%					
PT	22	0.00%	10	0.00%	84	0.02%	4,587	0.08%	190	0.01%	810	0.08%	4	0%	8	0.01%	1,540	0.05%				
RO	1,449	0.27%	560	0.21%	1,660	0.31%	32,414	0.54%	69,789	2.07%	4,330	0.40%	156	0.01%	155	0.17%	7,276	0.22%				
SI	114	0.02%	15	0.01%	no data	932	0.02%	365	0.01%	no data	5	0.00%	15	0.02%	106	0.00%						
SK	511	0.09%	6,875	2.55%	no data	2,450	0.04%	407	0.01%	no data	31	0.00%		822	0.02%							
ES	19	0.00%	21	0.01%	291	0.05%	3,870	0.07%	1,033	0.03%	780	0.07%	23	0.00%	17	0.02%	351	0.01%				
SE	5	0.00%	8	0.00%	1,018	0.19%	748	0.01%	51	0.00%	110	0.01%	25	0.00%	6	0.01%	119	0.00%				
GB	19	0.00%	65	0.02%	1,086	0.20%	4,305	0.07%	538	0.02%	1,760	0.16%	25	0.00%	20	0.02%						
TOTAL EU		0.94%		3.72%		2.75%		2.99%		2.70%		2.65%		0.09%		2.62%		0.99%				

Foreign offending by EU nationals was found to be low in volume in the EU member states analysed; it makes up approximately 4% of total crime in the Czech Republic, approximately 3% of total crime in Italy, Germany and Denmark, 2.5% in the Netherlands, 1.5% in Slovakia, and less than 1% in England, Austria and Poland [183-185]. The figures illustrate that the highest foreign offending according to EU nationality varied greatly between these nine countries.

Top offending EU nationalities are:

- in Austria: Romanian, German, Hungarian and Polish;
- in Belgium: Romanian, French and Dutch;
- in the Czech Republic: Slovakian, Polish, Romanian and Bulgarian;
- in Denmark: Polish, German and Polish;
- in England: Polish, Romanian and Latvian;
- in Germany: Polish, Romanian and Italian;
- in Italy: Romanian; Bulgarian and Polish;
- in the Netherlands: Polish, German and Romanian;
- in Poland: Lithuanian, Bulgarian, Czech, German, and Romanian; and
- in Slovakia: Czech, Polish, Hungarian, Italian and Romanian.

Data relating to the Netherlands, Belgium and Spain includes missing information for a number of EU28 nationalities and therefore we must consider these figures with care. However, this data is useful in order to illustrate general trends and consequently was included in the analysis.

The top offending nationalities were identified for each member state, first as a percentage of total crime. This identified Romanian, Polish and German nationals to be within the top five offending nationalities in each EU member state analysed. Subsequent statistical analysis was carried out using the MAD factor, to identify the significant nationalities for each country (see table 15).

Focusing on A8 and A2 accession countries, Romanian, Polish and Bulgarian offenders showed a high degree of dispersion across the EU, identified as a significant nationality by MAD factor analysis in over nine out of 10 possible countries. All remaining nationalities – Czech, Lithuanian, Hungarian, Croatian, Slovakian, Slovenian and Latvian – only illustrate significant MAD factor scores in less than two out of 10 possible countries.

In terms of migrating population, MAD factor was also calculated for foreign population, and identified Polish, Romanian and Bulgarian population to be significant. This time however, the dispersal is slightly less apparent. Polish and Romanian also showed a high degree of dispersion across the EU, a significant MAD factor was calculated in over nine out of 10 possible countries. Bulgarian and Croatian nationals were deemed significant nationalities in

approximately half of the 10 possible countries, and the remaining nationalities – Hungarian, Lithuanian, Slovakian and Czech nationals – illustrated a significant MAD factor score in less than two out of 10 possible countries.

Table 15: Mad factor analysis of significant offending nationalities for nine EU member states (MAD > 2, 2012).

Austria:	MAD		England/UK:	MAD		Netherlands:	MAD
Romanian	26.4		Polish	26.4		Polish	8.7
German	36.1		Romanian	22.9		German	5.6
Hungarian	26.2		Lithuanian	15.1		Romanian	4.8
Polish	18.8		Irish	8.4		Belgian	3.1
Slovakian	18.0		Latvian	6.3			
Croatian	16.3		Portuguese	3.9			
Bulgarian	8.3						
Czech	6.4						
Italian	4.7						
Slovenian	3.7						
Czech Republic:			Germany:			Poland:	
Slovakian	59.3		Polish	10.0		Lithuanian	10.8
Polish	24.0		Romanian	8.4		Romanian	8.6
Bulgarian	15.9		Italian	5.5		Bulgarian	5.5
Romanian	14.9		Bulgarian	2.7		German	5.8
German	9.1					Czech	4.9
Austrian	3.1						
Denmark:			Italy:			Slovakia:	
Polish	15.2		Romanian	21.1		Czech	69.1
German	6.5		Bulgarian	12.5		Hungarian	26.7
Romanian	5.6		Polish	9.3		Polish	18.9
Lithuania	3.3		French	6.0		Romanian	9.6
British	3.2		German	5.3		Austrian	8.2
Swedish	2.9		Croatian	5.0		German	6.6
			Spanish	2.1		Italian	5.5
						Bulgarian	2.1

The movement of people and offenders potentially suggests distinct spatial movement patterns, limited by the lack of comprehensive data from all EU member states. Romanian and Bulgarian offenders appear to spread predominantly from east to west, Polish offenders from east to west as well as north to south, and German offenders appeared to follow the distance decay effect (as the distance from home or other base increases, offending decreases [186]), as offending predominantly occurred in neighbouring countries, but also more widely across the EU. What is evident is the spatial distribution of these offenders across Europe, with more limited spatial movement from member states such as Latvia and Lithuania (only significant in Denmark, England and Poland). The northern European

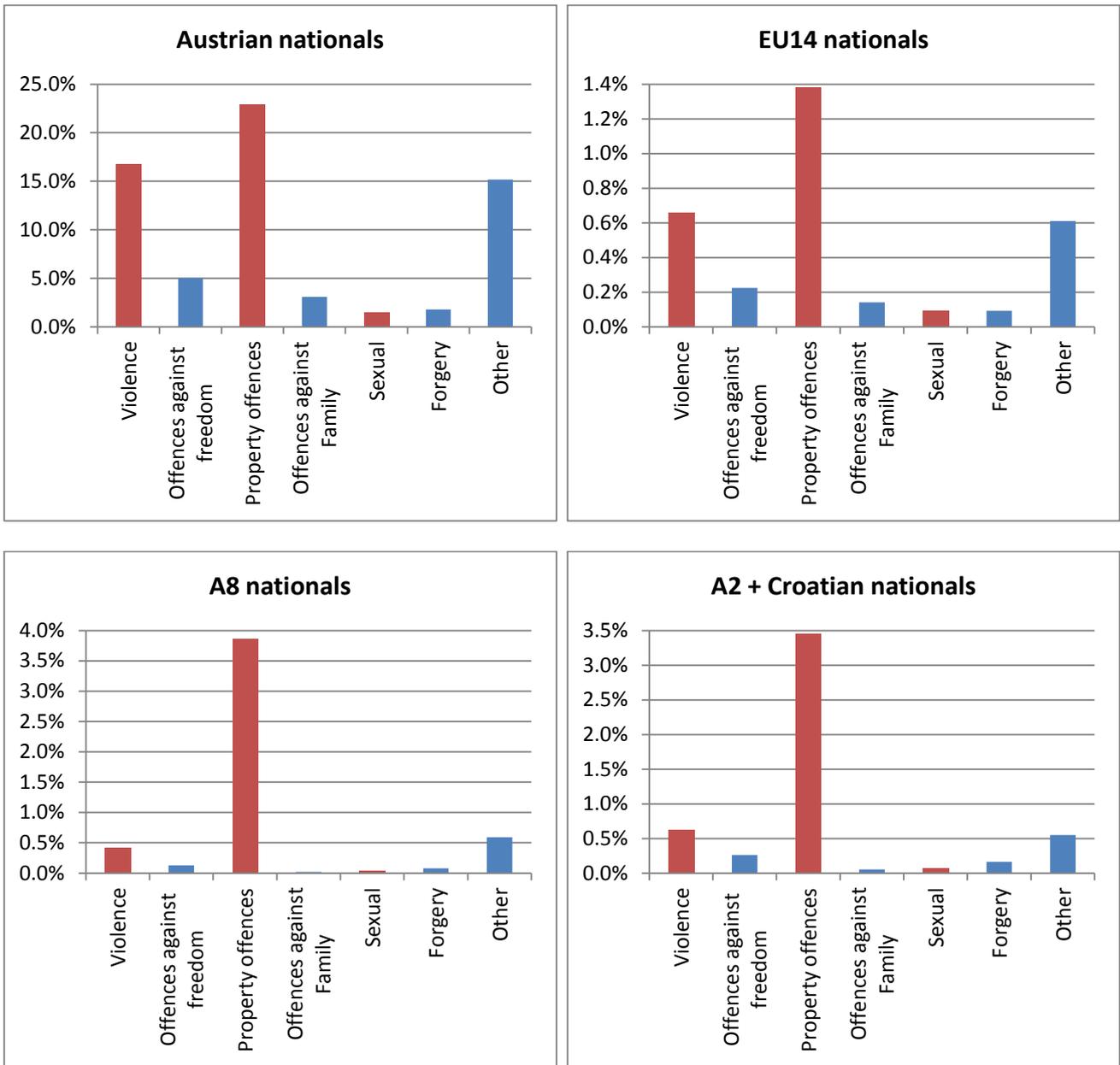
countries, especially the UK continue to remain very popular for Latvian migrants. Despite the ability to work in other EU countries, McCollum et al. (2013) states that labour migrants continued to prefer the UK due to greater language barriers in other countries and the UK's 'flexible' labour market, making it easier to access employment there than elsewhere in Europe [144].

Overall this research has found very limited availability of data with which migration and crime can be explored, utilizing publicly available data. Although it was possible to obtain information and data relating to population and crime for each country at a number of geographic scales, and some were able to provide data on foreign and native offenders/population at scales lower than country level, very limited data was available beyond that. It has become apparent that the public availability of data relating to nationality (or country of origin) of offenders is extremely limited. It is unclear what the underlying reasons behind this are; although it is not thought unreasonable to consider that they may be politically driven in nature. This research also identified the highly significant data uncertainty when trying to paint a macro cross-member state picture of the intra-EU migration and crime issue, providing limited knowledge generation opportunities without multi-disciplinary cooperation on an international level [185].

Data from England was able to identify five nationalities across the three years warranting further interest – Polish, Latvia, Lithuanian, Portuguese and Romanian nationalities (and Italian in 2011 and Irish nationalities in 2012-2013). The identification of outlier nationalities using a number of statistical tests in England provided areas of further analysis which once explored fully could have the potential to impact police policy, crime prevention and intelligence strategies for local police forces. The presence and importance of these nationalities could not be repeated for any EU member state at the meso scale. Some data regarding nationalities was identified at the macro country level, but with limited detail and incomplete nationality breakdown. We anticipate that geographic and nationality disparity would be evident in other EU member states, however the data is currently not available to prove this. Should this data become available in the future, it could be used to inform EU policy and policing initiatives, and provide an evidence base for effective data sharing across the EU.

Crime type

Preliminary data analysis of data relating to types of crimes committed by foreign offenders predominantly mirrors that of the UK. In Austria, EU nationals are predominantly convicted of property offences which include: criminal damage, theft, burglary, embezzlement, robbery, unauthorised use of vehicle, blackmail, fraud and receiving stolen goods (see figure 12).

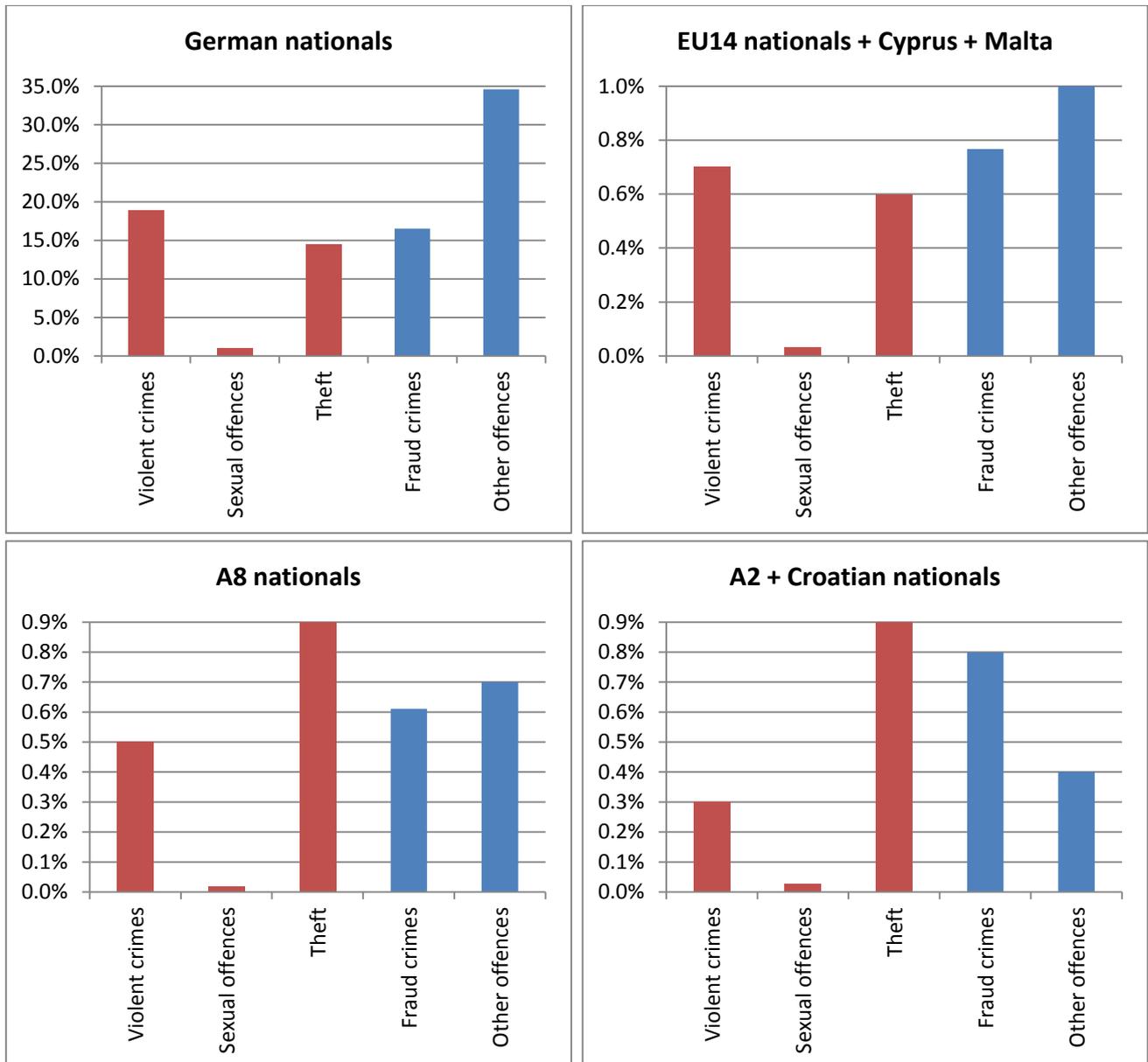


Violence against the person: murder, manslaughter, (aggravated) assault, GBH, injury affray
Offences against freedom: stalking, threat, coercion, trespassing
Property offences: criminal damage, theft, burglary, embezzlement, robbery, unauthorised use of vehicle, blackmail, fraud and receiving stolen goods
Sexual offences: rape, abuse of minors, sexual coercion

Figure 12: Types of crimes committed by Austrian, EU14, A8 and A2 nationals (as percentage of total crime)

Similar results are apparent for crimes committed in Germany (see figure 13). Violent offences are predominantly committed by German nationals and EU14 nationals. A8 and A2

nationals commit two to three times as many offences of theft, compared with violent offences, and this continues to provide evidence that A8 and A2 nationals appear to commit more acquisitive crimes than violent crimes.



Violent crimes: murder, euthanasia, manslaughter, abortion, robbery, crimes against personal freedom

Sexual offences: sexual abuse, rape

Theft: theft of MV, theft of motorcycle, shoplifting,

Fraud: embezzlement, fraud, falsification of documents,

Other offences: extortion, crimes against public order, receiving stolen property, money laundering, arson,

Figure 13: Types of crimes committed by German, EU14, A8 and A2 nationals (as percentage of total crime recorded)

Overall, this research supports previous findings. Despite immigration being popularly associated with crime, EU migrants do not have a significant impact, being responsible for a small proportion of crime in the countries analysed [185]. This research sought to further explore spatial diversity of selected intra-EU migrants by nationality, adding to knowledge of spatial distribution of offenders across England. Statistics published on migration are usually *“deprived of information on their spatial (regional) origin or destination”* and researchers try to estimate patterns using other demographic data [187]. Data relating to foreign nationals and crime are even harder to obtain, especially if the initial movement is not recorded. This is because administrative databases have not been designed primarily for statistical purposes and academic research, and are consequently imperfect sources of information [187].

Nationally held crime databases have the potential to be valuable in understanding and tackling transnational and migrant crime, however this is currently limited by the heterogeneity of recording systems [188]. Comparability of crime between different countries is hindered by variation in offence definitions and recording systems as discussed above. Attempts to compare crime data across Europe have tended to find higher rates of crime in Western Europe than in Central and Eastern Europe. The higher rates are likely to be the product of more accurate crime recording systems and reporting mechanisms in Western Europe and may not be a reflection of higher incidence of crime [189, 190].

Considering the implementation of EU policies enabling the exchange of bio-information, activity seeking to provide a more generalised and contextual EU wide picture of intra-EU migrant crime than has previously been carried out is reported here. Data on localised offending by foreign nationals can be used to inform intelligence by national and international police agencies, to generate effective cross-border information exchange. However, where such information is not collected and available for analysis within member states, informed knowledge between member states is difficult to achieve. Data is needed upon which requirements for inter-state communication can be built upon for positive investigatory, community safety and crime prevention benefits.

There is a clear need, in the modern technological, transnational society, for better data availability in this field. International policies *“could be informed by a better understanding of the geography of immigration at the national, regional, and local levels, which is itself reliant on a better understanding of the data sets available and discrepancies between them”* [191].

Informed cross-border information exchange between member states is difficult to achieve if information is not collected and made available. We have shown the benefits of analysing data relating to localised offending by foreign nationals in England, and have highlighted some of the problems of utilising openly available data across EU member states [31, 150, 184]. In order to inform intelligence by national and international police agencies, collective

understanding at the EU level is required, rather than simply continuing to focus on developing a national understanding for each EU member state individually in isolation.

Good governance fundamentally demands good data and within the governance of the multi-Member State EU system good data must also be comparable across Member State boundaries in order to properly inform decisions, policies, planning, resources and priorities with cross-Member State impacts. An ability to evaluate, inform, develop and learn from the Prüm decision will be compromised without the ability to establish context through the use of common data sets at cross-Member State level, and within this research access to common spatial context of such data sets is equally important. Having developed an intuitive analytical model raising valuable questions for planning, priorities and improvements that model needs to progress to transferability. Such transferability will inform a common platform of Member State governance on the Prüm activity at hand, but is currently hampered by the inability to utilise suitably relevant, suitably detailed or suitably comparable data sets.

The Prüm Implementation, Evaluation and Strengthening (P.I.E.S.) of Forensic DNA Data Exchange

Appendices to the Northumbria University Final Report

Appendix 1: MAD factor analysis

Counts of prosecution charges received for all non-UK EU nationals were prepared and the absolute deviation of counts from the median value of the distribution established per nationality. The Median Absolute Deviation (MAD) provides a robust method to identify outliers within data sets, a method of measurement generally undertaken by establishing values that are 2 or 3 standard deviations (SD) from the mean as opposed to the median, so identifying particularly high or low values and an indication of data diversity. Establishing the MAD provides a method of greater robustness than use of the mean and SD values due to mean values (and consequentially SD) being susceptible to outliers apparent in this data, and far more apparent in the counts of charges at force level. Within such a highly skewed data set use of the median absolute deviation, as opposed to standard deviations from the mean which are reliant on the mean value, can be used to reliably identify counts that are extreme. Scale used of 2 or 3 (or more) as multipliers of the MAD to indicate extreme values are subjective and choice is reliant on the researcher [192]. Crime data tend towards routinely skewed distributions and an often encountered issue in Policing practice is identification of impact when considering resource provision, often through use of the mean and SD values.

The concept of the MAD identifying outliers for removal can be reconsidered as providing a high integrity measure of the extremeness, or otherwise, of categories; in this case nationalities or Police force areas. Classification of 'extreme' therefore becomes the decision level that would otherwise be used to reject outliers from data. Here it was considered that values $<2>$ the MAD are suitable identifiers of extreme values [193], the purpose being to use the MAD as a robust and simply transferable method identifying categories of note for further or enhanced analysis as opposed to removal or disregard. The MAD is a measure of dispersion, or spread, around the median of the data set and the multiplier, termed the MAD factor in this analysis, offers the advantage of indicating the distance of the value from the decision criterion of >2 .

The MAD decision criteria was used to evidence selection of nationalities for analysis following which rates of prosecution charges by each responding force area were established as:

1. Rate of charges against total force crime
2. Rate of charges against force area total population
3. Rate of charges against population of non-UK EU nationals per force area
4. Rate of charges against population of the nationality under examination per force area

Of these rates and the simple counts of charges per force area MAD factors for each were calculated, identifying at the same decision level those areas displaying extreme values within distributions.

Appendix 2: Location Quotients

Spatial analysis focuses on the Location Quotient (LQ), an indicator traditionally and widely employed in the field of economics since the 1940s as a measure of regional and planning economics relative to local economic activity. A relatively simple measure the LQ maintains geographic relevance, placing a chosen geographic area into context through comparison with the wider area [194]. Infrequently used in the measurement of crime it provides a useful alternative view, providing information on a particular region in relation to its wider region [195].

$$LQ = \frac{C_{in} / C_{tn}}{\sum_{n-1}^N C_{in} / \sum_{n-1}^N C_{tn}}$$

C_{in} = count of offending by subject nationality in a specific area (e.g. police force area)

C_{tn} = count of population in specific area (e.g. police force area)

Sum of *C_{in}* = count of offending by nationality in wider area (e.g. whole country)

Sum of *C_{tn}* = count of population in wider area (e.g. whole country)

Bryant and Miller (1997) employed the technique in its original sense of measuring employment concentrations but as a predictor of crime [196]. Brantingham and Brantingham (1998) fruitfully used LQ's as an alternative and new method of identifying and understanding hot spots of crime [197]. Since initial introduction to the study of crime in the 1990's uptake as an analytical method for crime studies has been minimal [195, 198, 199].

Typically a density measurement tool it provides a measure of over or under representation relative to surrounding areas [199]. In this research we seek to identify spatial diversity and through the density measurement nature of LQs establish polygons displaying significantly high densities of intra-EU offending in comparison to two geographic scales; surrounding polygons and the wider spatial context of England.

Miller et al. (1997) identify useful benchmarks for interpreting the LQ, however their work reflected on the use of the LQ to analyse economic development rather than density measurement of crime [194]. Within the general economic/development related disciplines use of the LQ attracts certain assumptions, which to a point are dependent on the topic of study and nature of data but pose issues for LQ interpretation and establishment of statistical significance. Mack and Jacobson (1996) identify assumptions not so readily accounted for in economic/development studies as demanding empirical evaluation [200]. McCord and Ratcliffe (2009), in a crime related study, note the lack of statistical significance testing methods for LQ's available to them, however that study examined crime and spatial links with land use in a manner requiring LQ development and usage disparate to the study reported here [201].

O'Donoghue and Gleave (2004) detail the use of a Standardised Location Quotient (SLQ) to overcome the otherwise arbitrarily defined cut off point of LQ values, proposing the LQ array should first be tested using a Kolmogorov- Smirnov test for normality [202]. If normally distributed z values of the LQ lying beyond 1.96 standard deviations are considered extreme, representing the 5% level of statistical significance for a two tailed test or 1.64 standard deviations for a one tailed test. Heanue (2004) refines this, identifying the Shapiro-Wilk (S-W) test as a preferred test of normality [203]. Following Heanue's refinement we report the z values of the LQ to the 5%, two tailed level of significance, transforming the LQ into a SLQ. Where distributions were not found to be normal LQ values were logarithmically transformed and the S-W test repeated. If distributions cannot be determined as normal the SLQ cannot be used.

The Location Quotient is readily calculated and visualisation via cartographic representation provides an intuitive image identifying areal units significant in value yet maintaining the dual scale context of neighbouring areal units and macro spatial context of the issue under examination.

Appendix 3: Lorenze Curve & Gini Coefficient.

Comparison of the degree of concentration of offending between annual samples can be considered by calling on a second routine originating in economic orientated disciplines, namely the construction of a Lorenz Curve and the Gini coefficient for each sample.

The Lorenz curve is a graphical representation used extensively within economics, ecology and public health as a method to describe inequality in a given factor. Originating within economics in 1905 its primary use is succinctly described by Moskowitz et al (2008):

“In this context members of the population are ranked in terms of their wealth and the cumulative wealth is plotted (on the y-axis) against the cumulative proportion of the population (on the x-axis). One can then select any quantile to characterize concentration using a statistic such as ‘Y per cent of the wealth is owned by X per cent of the population’ [205].”

If all individual factors are the same size the Lorenz curve is a straight 45° diagonal line labelled the line of equality. Inequality will result in the Lorenz curve falling below the line of equality. Here it is used to evaluate the degree of concentration of intra EU offending in each calendar year sample within English Police Force areas, being a function of the cumulative proportion of ordered offending by Police Force polygons mapped onto the corresponding cumulative proportion of offending. Figure 14 displays an explanatory Lorenz Curve graphic. Twenty percent of all offending intersects both the line of equality and the Lorenz curve. The x axis intersection of the 20% gridline at the line of equality equates to 20% of all force polygons, representing equal division of offending between Police Force areas. Extending to the Lorenz Curve provides an intersect at 44% (n=16) of all Police Force polygons allowing the statement that 20% of all offending takes place within 44% of English Police Force polygons. Inversely translating to significant concentration as the remaining 20 Police Force areas (56%) experience 80% of all such crime.

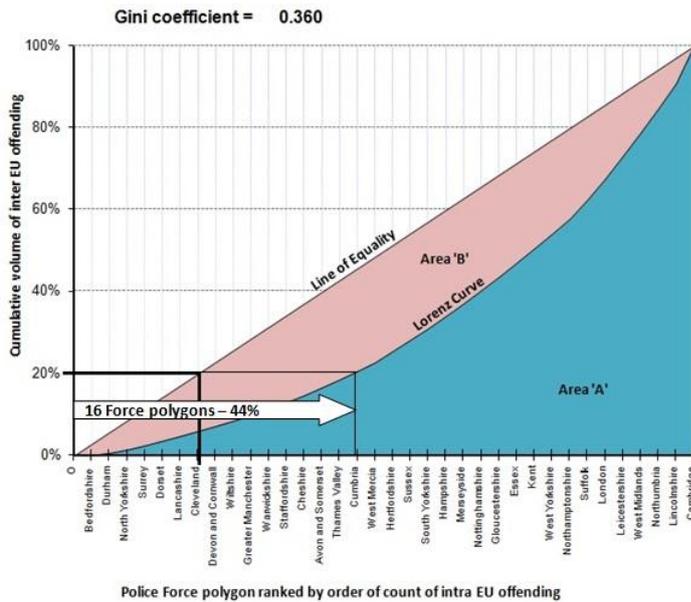


Figure 14: Explanatory Lorenz curve graphic.

Whilst usefully illustrating inequality a summary index of concentration, the Gini coefficient (G), is frequently presented in parallel. Gini coefficients summarise the total amount of inequality apparent in the sample, and range from a value of 0 (complete equality) to a theoretical value of 1 where, within an infinite population all is ‘owned’ by one factor. This coefficient is the ratio between the area enclosed by the line of equality and the Lorenz Curve and the total triangular area below the line of equality; the smaller the Gini coefficient the less concentrated the factor being assessed within the population under examination.

$$G = \frac{\sum_{i=1}^n (2i - n - 1)x'_i}{n^2 \mu}$$

Where n=number of ordered factors
 i=the size of an individual factor
 x'_i=the ranked order

Within the sphere of this research the Lorenz Curve and Gini coefficients provide measurements of inequality and concentration of intra EU offending within a spatial element of Police Force boundary polygons. Results provide potential corroboration of significant SLQ values and also allow comparison between calendar years as both annual samples have comparative spatial elements. Mining Lorenz Curve data provides the spatial elements (Police Forces) constituting quartiles in ranked order. In this case 8 Police forces are associated within the top quartile, ranked order signifying their individual position and context within such grouping. Comparison of Gini coefficients over time informs on the

dispersion (or otherwise) of offending by nationality at the macro scale. Examination of ranked position of a Police Force areal unit within data set quartiles between time periods, in parallel with knowledge of the SLQ position of a the areal unit may inform future risk of increased offending, indications of positive reduction initiatives and movement within the spatial patterns of offending.

Appendix 4: Administrative divisions of EU28 member states

Country	Administrative Divisions		
	NUTS1	NUTS2	NUTS3
Austria (AT)	3 Gruppen von Bundesländern	9 Bundesländer	80 Gruppen von Politischen Bezirken
Belgium (BE)	3 regions	11 provinces	44 arrondissements
Bulgaria (BG)	2 Rajoni	6 Rajoni za planirane	28 Oblasti
Cyprus (CY)			
Croatia (HR)		3 Regija	20 županije + capital city
Czech Republic (CZ)	1 Území	8 Oblasti	14 Kraje
Denmark (DK)		5 Regioner	11 Landsdeler
Estonia (EE)		5 Groups of Maakond	15 Maakond
Finland (FI)	2 Manner-Suomi, Ahvenanmaa/Fasta Finland, Åland	5 Suuralueet/Storområden	20 Maakunnat/ Landskap
France (FR)	9 Z.E.A.T + 1 DOM	27 Régions	101 Départements
Germany (DE)	16 Bundesländer	38 Regionsbezirke	412 Land/Stadt-kreise
Greece (EL)	4 Groups of development regions	13 Periféries	51 Nomoi
Hungary (HU)	3 Statisztikai nagyrégiók	7 Tervezési-statisztikai régiók	19 Magyék + Budapest
Ireland (IE)		2 Regions	8 Regional Authorities
Italy (IT)	5 Gruppi di regioni	21 Regioni	110 Provincie
Latvia (LV)			5 Statistiskie reģioni
Lithuania (LT)			10 Apskritis
Luxembourg (LU)			
Netherlands (NL)	4 Landsdelen	12 Provincies	40 COROP Regio's
Malta (MT)		2 Gzejjer	6 Distretti
Poland (PL)	6 Regiony	16 Województwa	66 Podregiony
Portugal (PT)	3 Continente + Regioes autonomas	7 Comissaoes de Coordenacao regional + Regioes autonomas	30 Grupos de Concelhos
Romania (RO)	4 Macroregiuni	8 Regiuni	41 Judete + 1 city
Slovenia (SI)		2 Kohezijske regije	12 Statistične regije
Slovakia (SK)		4 Oblasti	8 Kraje
Spain (ES)	7 Agrupación de comunidades autónomas	17 Comunidades y ciudades autónomas + 2 cities	50 Provincias
Sweden (SE)	3 Grupper av riksområden	8 Riksområden	21 Län
UK	12 Regions	37 counties	139 Districts

Appendix 5: Overview of data availability, including the socio-demographic factors pertinent to the analysis and the geographic level they are available for each of the EU28 members states.

a) EU15 Countries

Factor \ Country		AT	BE	DE	DK	FI	FR	IT	NL	PT	ES	SE
Population	Country (NUTS1)	X	X	X	X	X	X	X	X	X	X	X
	Region (NUTS2)	X	X	X	X	X	X	X	X	X	X	X
	County (NUTS3)	X	X	X	X	X	X	X	X	X		X
Foreign Population	Country (NUTS1)	X	X	X	X	X	X	X	X	X	X	X
	Region (NUTS2)	X	X	X	X	X	X	X	X	X	X	X
	County (NUTS3)		X	X	X	X	X	X	X	X		X
Crime	Country (NUTS1)	X	X	X	X	X	X	X	X	X	X	X
	Region (NUTS2)	X	X	X	X	X	X	X	X	X	X	X
	County (NUTS3)		X	X	X	X	X	X	X	X		
Crime (native v foreign offenders)	Country (NUTS1)	X		X	X	X	X	X	X		X	
	Region (NUTS2)	X		X	X	X	X	X			X	
	County (NUTS3)			X	X	X	X					
Crime by nationality	Country (NUTS1)	X		X	X			X	X			
	Region (NUTS2)	X		X								
	County (NUTS3)											

* No data was available for Greece and Ireland

* Luxembourg is not included in the table due to single geographic division due to size of country.

* The UK is also not included in this table, as the data was sources separately.

b) A10 Countries

Factor \ Country		CZ	EE	HU	LV	LT	PO	SI	SK
Population	Country (NUTS1)	X	X	X	X	X	X	X	X
	Region (NUTS2)	X	X	X	X	X	X	X	X
	County (NUTS3)	X	X			X		X	
Foreign Population	Country (NUTS1)	X	X	X	X			X	
	Region (NUTS2)	X	X	X	X			X	
	County (NUTS3)	X						X	
Crime	Country (NUTS1)	X	X	X	X	X	X	X	X
	Region (NUTS2)	X	X	X	X	X	X	X	X
	County (NUTS3)	X				X			
Crime (native v foreign offenders)	Country (NUTS1)								
	Region (NUTS2)								
	County (NUTS3)								
Crime by nationality	Country (NUTS1)	X					X		X
	Region (NUTS2)								
	County (NUTS3)								

* No data was available for Malta and Cyprus (no geographic divisions)

c) A2 and Croatia

Factor \ Country		RO	BG	HR
Population	Country (NUTS1)	X	X	X
	Region (NUTS2)	X	X	X
	County (NUTS3)	X	X	X
Foreign Population	Country (NUTS1)	X	X	X
	Region (NUTS2)	X	X	X
	County (NUTS3)	X	X	X
Crime	Country (NUTS1)	X	X	
	Region (NUTS2)	X	X	
	County (NUTS3)			
Crime (native v foreign offenders)	Country (NUTS1)			
	Region (NUTS2)			
	County (NUTS3)			
Crime by nationality	Country (NUTS1)			
	Region (NUTS2)			
	County (NUTS3)			

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