Immigration and Crimes against Natives:
The 2015 Refugee Crisis in Germany

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Abstract. In the 2015 refugee crisis, nearly one million refugees came to Germany, raising concern that crimes against natives would rise. Using novel county-level data, we study this question empirically in first-difference and 2SLS regressions. Our results do not support the view that Germans were victimized in greater numbers by refugees as measured by their rate of victimization in crimes with refugee suspects. Our findings are of great policy and public interest, and also of material relevance for the broader literature on immigration and crime which considers only crimes per capita or variants thereof, but never actual crimes by foreigners against natives. We show that this shortcoming can lead to biased inference.

Keywords: Immigration, refugees, crimes, crimes against natives

JEL Classification: F22, J15, K42.

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1 Introduction

During the 2015 European refugee crisis, which was fueled by the conflict in the Syrian Arab Republic (Tumen, 2016), nearly one million refugees poured into Germany.[1] This largest inflow of refugees to Germany since the early 1990s (Bundesamt für Migration und Flüchtlinge (BAMF), 2016a) posed, and continues to pose, great challenges for state authorities, society and the economy. A major concern among the German public, and one particularly exploited by populist right parties, was that this mass immigration could lead to more crime by refugees against natives (Frankfurter Allgemeine, 2017; Mitteldeutscher Rundfunk, 2017).

Little is known, however, whether such fears were justified. Empirical studies for Germany on the 2015 refugee crisis are still rare and use data ill-suited to measure refugee inflows during the crisis in 2015 (Dehos, 2017; Gehrsitz and Ungerer, 2018), which limits their explanatory power.[2] The broader literature on immigration and crime also provides little guidance on this question, given its predominant focus on non-refugee immigration and the mixed findings it produced.[3] Above all, however, studies in both bodies of literature suffer from a basic but fundamental shortcoming which has received little, if any, attention to date. They standardly make use of but crude crime or victimization rates in their analyses, that is crimes and victims per capita, or variants thereof, but never of actual rates of victimization of natives by refugees or foreigners. This drawback weighs heavily, for crude crime and victimization rates are only a very imperfect measure of the latter, including in their count also crimes confined to foreigners (crimes by and against foreigners), crimes confined to natives (crimes by and against natives), and crimes in which foreigners are victimized by natives (crimes by natives against foreigners), which includes even hate or anti-foreigner crimes. As each of these crimes may vary in its prevalence systematically with the level of immigration, crude crime and victimization rates are rather inappropriate for investigating whether natives are harmed by immigration. In fact, as we will show, their use can lead to seriously biased inference.

Given the paucity of evidence on the matter, we draw on two novel data sets to study the

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[1]We consider as refugees all individuals who came to Germany in 2015 and registered formally or informally as seeking protection with the intend to lodge a formal asylum application (irrespective of their later residence status and the outcome of their asylum application). We hence, and henceforth, use the terms refugee and asylum seeker interchangeably in this study.

[2]Dehos (2017) uses data from the Central Register of Foreigners (CRF) which massively under-records refugee arrivals in 2015 (see Section 2.1). Gehrsitz and Ungerer (2018) study not refugee arrivals in the crisis year 2015, but (the summary total of) refugee arrivals over a two-year period (2014-2015) which include refugees who arrived in the pre-crisis year 2014.

[3]See, for example, Amuedo-Dorantes et al. (2018), Bell et al. (2013), Bianchi et al. (2012), Butcher and Piehl (1998), Chalfin (2014), Chalfin (2015), Lee et al. (2001), Light and Miller (2018), Mastrobuoni and Pinotti (2011), Moehling and Piehl (2009), Nunziata (2015), Ozden et al. (2018), Pfeiffer et al. (2018), Piopiunik and Ruhose (2017), and Spenkuch (2014).

impact that the 2015 refugee crisis had on the scale and type of crime committed in Germany. The first data set comprises detailed, high-quality statistics on the regional distribution of refugees, their gender composition, age structure, and type of accommodation (decentralized or centralized, i.e. in group quarters)[4], prior to and after the mass inflow of refugees in the latter part of 2015. This data set has been constructed from special data extracts drawn from the Statistic on Asylum Seekers' Benefits (SASB) (*"Asylbewerberleistungsstatistik"*), an administrative public registry with full coverage of all refugees who seek asylum and receive such benefits in Germany. Other data sources used in the literature lack such full coverage, including the Central Register of Foreigners (CRF) (*"Ausländerzentralregister"*), the most common source used to quantify regional foreign populations.[5] Our special data extracts from the SASB allow us to study also compositional features of regional refugee populations, such as their gender composition and accommodation structure. Both of these compositional features of regional refugee populations, hitherto disregarded in analyses of (refugee) immigration and crime for Germany, may have a direct and independent impact on crime. They are thus of great policy interest too, all the more so, since public refugee distribution policies can easily be tailored to and targeted at these measures. The second data set comprises special data extracts from the Police Crime Statistic (PCS) (*"Polizeiliche Kriminalstatistik"*) of the Federal Criminal Police Office (BKA) (*"Bundeskriminalamt"*) in Germany which allow us to consider not only the numbers and rates of different kinds of crime, as is common in the literature, but also associated suspects (by refugee status) and victims (by German nationality) for a subset of crimes (cleared-up crimes with victim recording in the PCS)[6], and therefore, what is unique, actual victimization rates of natives in crimes in which refugees are suspects. The richness of our data hence makes it possible to study in unprecedented detail potential links between crime and the size of immigration, its gender structure, age composition, and housing. Furthermore, it allows us to assess whether the analysis of crude crime and victimization rates, as is standard in the literature, may give rise to biased inference when such measures are used to identify, and quantify, criminal activity of immigrants that is directed against natives.

Exploiting for identification in first-difference regressions spatial-temporal variation across

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[4]Centralized refugee accommodation comprises reception centers (*"Aufnahmeeinrichtungen"*) and other types of shared housing, i.e. general group quarters (*"Gemeinschaftsunterkünfte"*), and decentralized refugee accommodation in non-shared dwellings, in particular individual flats.

[5]In fact, nearly half of all refugee inflows in 2015 remained unrecorded in the CRF (for more details, see Section 2.1).

[6]Victim data are recorded (and reported in the PCS) only for natural persons and crimes that involve some form of physical harm or threats to personal integrity and self-determination, such as dangerous and serious bodily injuries, intentional simple bodily injuries, various kinds of robberies (e.g. robberies in streets, lanes or public places), and rape and other forms of sexual coercion. Cleared-up crimes are crimes with non-missing suspect information. For further details, see Section 3.1.

counties in refugee immigration levels and refugee populations' age, gender, and housing structures before and after the mass inflows of refugees to Germany in the latter half of 2015, we find evidence for a hump-shaped relation between the scale of refugee immigration and both the crime rate and the overall victimization in a county. We also find that decentralized accommodation of refugees, at given levels of refugee immigration to a county, tends to reduce the crime rate (while refugee sex ratios exert no effect). We do not find, however, any evidence for a systematic link between the scale of refugee immigration (and neither the type of refugee accommodation or refugee sex ratios) and the risk of Germans to become victims of a crime in which refugees are suspects. This result holds true not only for total crimes with victim recording in the PCS, but also for various sub-categories of such crimes, including robbery (economic crimes), bodily injury (violent crimes), and rape and sexual coercion (sex crimes). We corroborate this key finding in various robustness checks, including the measurement of victimization outcomes in 2016 (rather than 2015) and the use of IV regressions that exploit for identification information on the 2014 pre-crisis location of refugee reception centers and their aerial distance to population-weighted centroids of counties located within the same federal state. The persistent lack of a link between refugee immigration and refugee crimes against Germans casts doubt on whether public concerns about refugees and crimes against natives were justified. It also underscores, more generally, the importance of using detailed crime, suspect and victim statistics for analyses of immigration and foreigner crimes against natives. Studies on immigration and crime generally fail to use such data. Our findings suggest that this failure may be a serious one that could lead to biased inference, bad policy advice, and misled public opinion.

Our study relates and contributes to a growing body of literature on immigration (by refugees or economic migrants) and crime. Bell et al. (2013), who investigate refugee migrant inflows to the UK in the late 1990s and early 2000s, exploit official allocation rules for asylum seekers of the National Asylum Support Service. They find evidence for a slight increase in property crimes, but no evidence for an effect on other types of crimes. Bianchi et al. (2012), who study immigration to Italy during the period 1990–2003, use IV regressions that exploit information on migrant flows to other destination countries which are driven, at least in part, by supply-push factors operating in origin countries that should also affect migrant flows to Italy. The authors find a statistical positive effect of immigration on the incidence of robberies at province level. Mastrobuoni and Pinotti (2011), who focus on the legal status of immigrants in Italy, exploit a natural experiment (European Union enlargement) for identification. They show that possession of legal residence status reduced the propensity of immigrants to commit a crime in areas that provide better labor market opportunities. Butcher and Piehl (1998), in contrast, find no evidence for an effect of immigration on crime

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rates in metropolitan areas in the U.S. during the 1980s. They also produce evidence which suggests that young immigrants are even less likely to commit a crime than young natives. Instrumenting migration by rainfall shocks in network-linked Mexican states, Chalfin (2014) finds that Mexican migration to the U.S., while not affecting overall crime levels, appears to have caused a modest increase in robberies. Focusing on violent and property crimes, Chalfin (2015) furthermore provides evidence that Mexican immigration significantly reduced rape and larceny, but tended to increase rates of assault. Spenkuch (2014), using panel data on U.S. counties from 1980 to 2000 in first-difference regressions, finds again a positive but small impact of immigration on property crimes, but no evidence for an effect on violent crimes. A recent study for the U.S. by Amuedo-Dorantes et al. (2018), which exploits the geographic and temporal distribution of refugees across counties in the years 2006 through 2014 using the shift-share method, fails to find a significant association between refugee settlements and local crime rates or terrorist events. The same holds true for the studies by Lee et al. (2001), Light and Miller (2018) and Moehling and Piehl (2009), which also focus on the United States. A study by Ozden et al. (2018) for Malaysia, in contrast, finds a sizable and statistically significant negative effect of economic immigration on property and violent crimes. The study uses data from 2003 to 2010 and employs changes in the population and age structure of immigrant source countries as an instrument for immigrant inflows. Exploiting variation in immigration flows to western European countries in the 2000s, Nunziata (2015) again finds no evidence for an effect of immigration on crime victimization in Europe when unobservable regional characteristics are controlled for. Piopiunik and Ruhose (2017), who investigate for Germany in the period 1997-2006 the relationship between immigration of ethnic Germans from Eastern Europe and crime, find that immigration increases crime rates in regions with high unemployment, high population density, high pre-existing crime levels, and large population shares of foreigners. Dehos (2017), using CRF data (despite its severe refugee undercount in 2015) and studying refugee migration to Germany during the years 2010 to 2015, in contrast, finds no impact of asylum seekers, i.e. recent refugee inflows, on the overall crime rate excluding immigration-related offenses such as unauthorized entry, i.e. border crossings, and unauthorized stay, but a positive association between the latter and recognized refugees who hold a residency title. Finally, and also closely related to our study, Gehrsitz and Ungerer (2018), who study pooled refugee inflows to Germany over the two year period 2014 to 2015, find evidence for a small positive effect of these two-year inflows on crimes, in particular drug offenses and fare-dodging. The failure to differentiate between inflows in the pre-crisis year 2014 and the crisis year 2015, however, limits the explanatory power of their findings on the crime effect of the mass inflow of refugees during the 2015 refugee crisis. Summarizing the above, findings in the literature on immigration and crime

are mixed, and few studies consider refugee immigration. Those that do, and focus on Germany, furthermore suffer from data defects in the measurement of regional refugee inflows during the 2015 refugee crisis. Above all, however, none of the studies reviewed above makes use of data on actual crimes committed, or allegedly committed, by foreigners against natives which are at the heart of public concerns about immigration and crime, and also the raison d'être that motivated this area of research in economics. Given our novel data, we can address both data defects.

The paper proceeds as follows. Section 2 provides background information on the 2015 refugee crisis and the scale and development of criminal activities in Germany in recent years. Section 3 describes the data sources we employ, defines all variables we use in the empirical analysis, and outlines our estimation strategy. Section 4 presents some core results for total crime (the standard in the literature), and Section 5 in-depth analyses of refugee crime against Germans. Section 5 contains our main regression results, explores the importance of demographic features of refugee populations (their age-gender structure) and their accommodation, probes the robustness of our main findings on the victimization of natives, and inquires into potential effect heterogeneity across different types of crimes. Finally, Section 6 summarizes our main findings and concludes.

2 Background

In this section, we first provide a brief summary of the 2015 refugee crisis and its evolution in Germany, and present and discuss some background statistics on asylum seekers, asylum applications, and the regional distribution of refugees (Section 2.1). After that, in Section 2.2, we document the temporal evolution of criminal activities in Germany in recent years.

2.1 The 2015 Refugee Crisis

Germany has a long and diverse history of immigration. Between 1991 to 2015 alone, 24.9 million immigrants came to Germany, including repatriates, asylum seekers, migrant workers, and EU citizens (BAMF, 2016b). However, the year 2015 was exceptional. In its final months, a sudden, and largely unexpected, mass inflow of refugees to Germany set in amidst what came to develop into, and be termed, the 2015 European Refugee Crisis. Many of these refugees were Syrians seeking shelter from their war-torn country after years of brutal civil war has ravaged the Syrian Arab Republic. They were joined by Syrians who had already resided in neighboring countries but left these heading for Europe because of lack of perspective and economic hardship (United Nations High Commissioner for Refugees

(UNHCR), 2015) as well as other migrants from the Middle East and the Islamic World that tried to escape political instability, armed conflict, and state repression. The refugee crisis that developed and eventually reached Europe was soon regarded as "the world's largest humanitarian crisis since World War II" (European Civil Protection and Humanitarian Aid Operations (ECHO), 2016).

Angela Merkel, the long-standing German chancellor, pointed out at a press conference in Berlin on 31 August 2015 that Europe as a whole must react to the refugee crisis and that European countries should take joint responsibility for asylum seekers seeking shelter in Europe (Bundesregierung, 2015b). A few days later, on 4 September 2015, Merkel opened the German border to refugees who had been stuck in the train station of Budapest for days (Blume et al., 2016). She also announced that there was to be no upper limit on the number of asylum seekers that would be allowed to seek shelter in Germany (Bröcker and Quadbeck, 2015). With borders open, many took the chance, and hundreds of thousands of individuals, displaced from their home country, prosecuted, or deprived of economic prospects in their region of origin, poured into Germany in the months that followed.

Approximately 890,000 refugees arrived to Germany in 2015 (BAMF, 2016b). The number of asylum applications had been increasing steadily but slowly already from January 2014, but it was only in the last quarter of 2015 that refugee numbers suddenly jumped dramatically (BAMF, 2015). The (most populous) federal states of Bavaria, North Rhine-Westphalia and Baden-Württemberg recorded most refugees at the end of 2015, about 48.4% of the country's total. 60.5% of refugees were aged between 15 to 39 and men outnumbered women in this age group by a ratio of 2.81 to 1, a quite unfavorable age-gender mix, not only for marriage markets, but usually also for crime.[7]

When refugees arrived to Germany, they had to report to a state organization immediately or within short notice. They could report directly at the border when crossing it, and border authorities then sent them to the nearest refugee reception center (BAMF, 2016c), or post entry at one of several state institutions, including the police, a branch office of the Federal Office for Migration and Refugees (BAMF) (*"Bundesamt für Migration and Flüchtlinge"*), or a reception facility (BAMF, 2016c). Asylum procedures only commenced if refugees had made such an initial declaration. All individuals who declared their intend to seek asylum in Germany were registered and received a proof of arrival, the so-called Asylum-Seeker Registration Certificate (BüMA) (*"Bescheinigung über die Meldung als Asylsuchender"*), an official identification document that entitled its holders to reside in Germany and receive asylum benefits in accordance with the Act on Benefits for Asylum

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[7]The reported percentage figures and the refugee sex ratio have been calculated by the authors using data from the SASB.

Seekers (AsylbLG) (*"Asylbewerberleistungsgesetz"*) and the Asylum Act (AsylG) (*"Asylgesetz"*), which include, amongst other things, accommodation, medical treatment, and food (BAMF, 2016b; BAMF, 2016c; §55(1) AsylG; §1 AsylbLG). In our analysis, we use high-quality register data on these recipients (some in the form of unique special data extracts), drawn from the Statistic on Asylum Seekers' Benefits (SASB), an end-of-year (EoY) compulsory count with full coverage of all individuals receiving any such kind of benefit in Germany. The issuing of the BüMA certificate initiated the first step of the official asylum procedure. The formal filing and registration of applications for asylum with the BAMF (formal registration, i.e. CRF - registration), in contrast, was often delayed for weeks, as state authorities were overburdened and understaffed to handle the massive numbers of formal requests. This complicated, and in parts made impossible, the statistical recording of actual refugee numbers in public registries which took stock only of those refugees that had already filed their formal applications for asylum (unlike the SASB which we use for our analysis). The Central Register of Foreigners (CRF) is such a registry and it has been used in parts of the literature, despite its severe undercount of refugees (Zeit Online, 2015; Statistisches Bundesamt, 2018). In fact, nearly half of all refugee inflows in 2015 recorded in the EASY-system (revised figures) remained unrecorded in the CRF (BAMF, 2016b).

The initial (and still informal) registration of the request for asylum was registered in the EASY system (*"Erstverteilung der Asylbegehrenden"*), whose records provided the basis for the initial distribution of asylum seekers onto the federal states in accordance with the "Königstein Key" (*"Königsteiner Schlüssel"*). The "Königstein Key" is a pre-determined quota set by the Federation-Länder Commission based on the tax revenues and population sizes of federal states two years prior so as to achieve an adequate and fair distribution of asylum seekers across states (BAMF, 2016c). Figure 1 documents for the whole of Germany and the years 2014 to 2016 monthly inflows of asylum seekers, as recorded in the EASY data, and monthly totals of formal asylum applications filed with the BAMF. As can be seen, the former shows a clear and sudden surge in the latter part of 2015 (the heyday of the crisis), while (formal) asylum applications filed with the BAMF, as a result of the afore-mentioned delays, continue to follow a smooth upward trend throughout 2015 and peak only in summer 2016.

Asylum seekers were obliged to live in the reception center to which they were allocated for up to three months, a limit that was extended to six months by the Act on the Acceleration of Asylum Procedures (*"Asylverfahrensbeschleunigungsgesetz"*, or *AsylVfBeschlG*) on 24 October 2015 (§47 AsylG). They were also obliged to reside (*"Residenzpflicht"*) for the first three months of the asylum procedure within a designated area, which could be a county, an administrative district or the entire state in which they lived, depending on

FIG. 1: Asylum seekers and asylum applications in Germany, 2014 to 2016
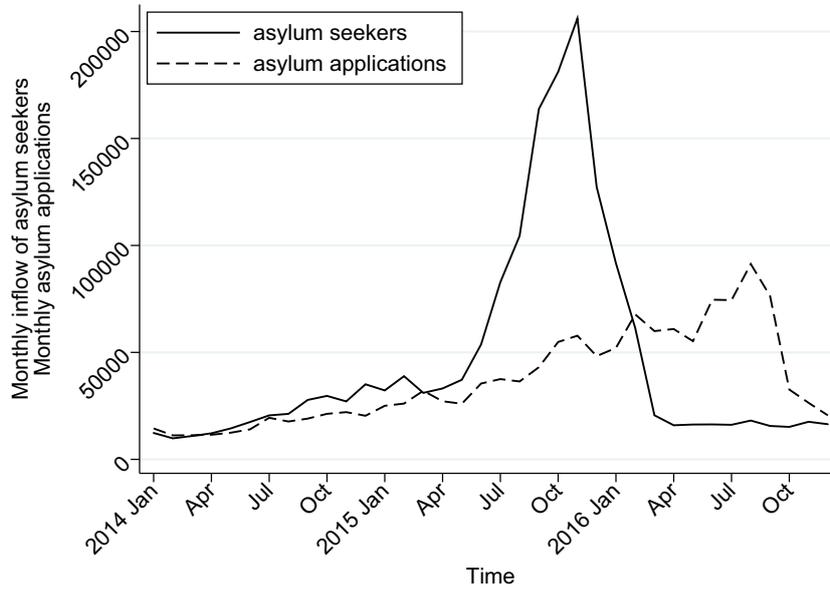
Notes: The figure plots monthly inflows of asylum seekers, as recorded in the EASY data, and monthly totals of formal asylum applications filed with the BAMF.

the state to which they had been allocated (§56 AsylG; §61 Aufenthaltsgesetz (AufenthG)). These spatial restrictions were lifted when asylum seekers had been continuously allowed, tolerated or permitted to stay in Germany for three months (§61 AufenthG). If applicants were entitled to asylum (*"Asylberechtigter"*) (Art. 16a(1) Grundgesetz (GG)), or granted refugee status (*"Anerkannter Flüchtling"*) (§3(1) AsylG), they received a residence permit for three years (§§25(1) or (2), 26 AufenthG), upon which they ceased to receive asylum seeker benefits but qualified for the receipt of social benefits in accordance with *"Sozialgesetzbuch"* (SGB) II and XII (§7 SGB II, §19 SGB XII). If applicants received only subsidiary protection (§4(1) AsylG), were entitled to stay because of a ban preventing their deportation (§60(5) or (7) AufenthG), or their deportation was temporarily postponed (§60a AufenthG), they continued to be entitled to asylum seeker benefits if the residency title granted to them did not exceed six months (§1(2) AsylbLG). The latter restriction did not apply in cases where a temporary right to reside was issued (i.e. *"Aufenthaltsgewährung"*) on the basis of international law or on humanitarian grounds (§1(1) no. 3 AsylbLG; §§23(1), 24, 25(4) or (5) AufenthG).

2.2 Criminal Activity in Germany

Drawing on data from the Police Crime Statistic (PCS) of the Federal Criminal Police Office (BKA), this section documents recent aggregate trends in crime and victimization rates in Germany as well as changes in criminal activity between pre-crisis year 2014 and crisis year 2015 for the 402 administrative counties that existed in Germany at the time.

Figure 2 shows for the whole of Germany annual numbers of registered asylum seekers (end of year), crimes, and victims in the years 2011 to 2015, as well as annual numbers of German victims in the years 2013 to 2015.[8] Annual figures for asylum seekers, crimes, and victims are normalized per 100,000 population; numbers for German victims per annum are per 100,000 German population. Panel (a) in Figure 2 shows a steady but slow increase in asylum seekers per 100,000 population in the years 2011 to 2014 which is followed by a sudden and dramatic surge in the population share of refugees between 2014 and 2015. As shown in Panel (b), this surge is not accompanied by a surge in crimes excluding violations of the Residence Act, the Asylum Act and the Freedom of Movement Act E.U., such as unauthorized entry (border crossing) and unauthorized stay. In fact, the rate of such crimes declined from 2014 to 2015. Panels (c) and (d) show that the total victimization rate (total victims per 100,000 population) and the victimization rate of Germans (per 100,000 German population) also declined from 2014 to 2015. These recent aggregate trends, therefore, do not provide any indication that crime or risks of victimization (overall and for Germans) increased during the 2015 refugee crisis. In fact, they suggest that Germany got safer, if anything, not less safe as feared by many and propagated also by populist-right parties.

Crimes with refugee suspects, however, saw a significant increase in police crime statistics in 2015 (BKA, 2015).[9] Excluding immigration-related offenses such as unauthorized entry and unauthorized stay in violation of the Residence Act (crime key: 890000), a total of 206,201 offenses (crimes) were recorded in 2015 in which at least one suspect was a refugee. This total marked an increase of 79% on 2014, which saw only 115,011 such offenses (BKA, 2015).[10] From late 2015, media reports of increasing numbers of burglaries, and of (sexual) assaults in particular, such as those occurring on New Year's Eve 2015/16 in Cologne, Hamburg, Stuttgart and other cities, also increasingly fueled concerns about public safety,

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[8]Data on refugees (asylum seekers receiving regular benefits in accordance with the Act on Benefits for Asylum seekers (*"Empfänger von Regelleistungen nach dem Asylbewerberleistungsgesetz"*)) has been obtained from the GENESIS-Online database of the Federal Statistical Office in Germany (*"Statistisches Bundesamt"*). Data on crime, victims and German victims are taken from PCS statistics provided online for download at the website of the BKA.

[9]Refugee suspects in the BKA report are identified by the residence status of foreign suspects from 20 selected countries and include asylum applicants, individuals with temporary suspension of deportation (*"Duldung"*), quota or civil war refugees, and irregulars (individuals on unauthorized stay).

[10]In total, 59,912 refugee suspects were recorded in 2014, and 114,238 in 2015 (BKA, 2015).

FIG. 2: Asylum seekers, crimes, victims, and German victims in Germany, 2011-15

(a) Asylum seekers

(b) Crimes

(c) Victims

(d) German victims
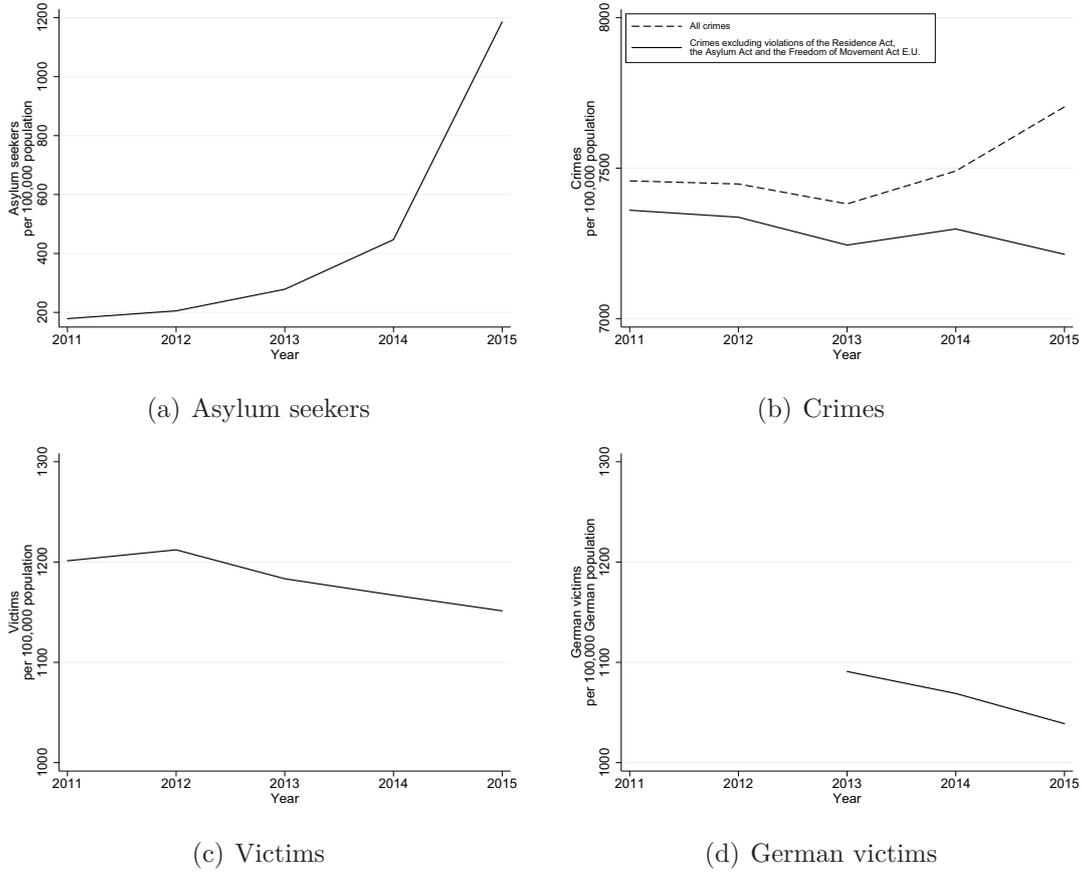
spurring demands for state intervention, in particular the call for an upper cap on refugee inflows to Germany.

Crimes with refugee suspects, however, do not necessarily imply harm done to Germans (if directed at other immigrants, including refugees). Increases in sub-categories of crime at aggregate level may have multiple causes too, and hence need not be driven (predominantly, let alone exclusively) by refugee inflows to Germany in 2015. The mass assaults on New Year's Eve 2015/16, while unprecedented, shocking, and a clear turning point for public opinion concerning refugee immigration to Germany, are also insufficient, by themselves, to judge, whether, and to what extent, Germans, because of the mass inflow of refugees, were facing increased risks of being victimized by refugees, throughout the year, in different parts of Germany, and in different types of crimes. What is more, criminal investigations into the New Year's Eve 2015/16 events in Cologne have proved extremely difficult to the effect that, more than three years after the event, statistics on convictions still provide only very little hard evidence on, and hence only a very incomplete picture of, the scale and type of assaults

that occured.[11]

In fact, and as shown graphically in administrative maps of Germany in panels (a) to (d) in Figure 3, changes at county level between 2014 and 2015 in population shares of asylum seekers, crime rates, population victimization rates, and rates of victimization of Germans were far from uniform across Germany.[12] What is more, changes in measures of crime incidence between 2014 and 2015 are also negative for the majority of the 402 counties in Germany (although nearly all counties saw a rise in the population share of asylum seekers between these two years (393/402 counties)). 229/402 counties witnessed a decline in the crime rate between 2014 and 2015, 193/402 a decline in the population victimization rate, and 253/402 a decline in the rate of victimization of Germans. According to these measures, therefore, life got safer between 2014 and 2015, not less safe, also in most parts of Germany. Crude eye balling also suggests no clear correlations between regional patterns in the population shares of asylum seekers and any of the three measures of crime incidence across time, and neither do respective bivariate correlation coefficients.[13]

However, refugee populations did not only increase across counties at different rates between 2014 and 2015. There was also great heterogeneity in compositional changes of refugee populations at county level. Figure 4 documents, again graphically, two such compositional changes, changes in male-to-female sex ratios among prime-aged refugees, and changes in the share of refugees who live in decentralized accommodation.[14] Again, crude eye balling suggests no clear correlations between these features of regional refugee populations. The same holds true for both features and changes in the population share of refugees, as well as changes in crime exposure and changes in rates of victimization (overall and for Germans)

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[11]More than 1,000 charges have been recorded for various offenses, but by March 2019 only 290 suspects could be identified by the police, and only 52 suspects (in 43 court cases) were charged in court, 6 of them for sexual offenses (leading to 3 convictions) (Zeit Online, 2019).

[12]In Figure 3, negative county values for a measure are indicated by a light grey shading, and positive county values are classified into 4 quartiles (the darker the color of a county, the larger is the change in a measure).

[13]Correlation coefficients are small and mostly negative. For changes in crime rates, the correlation coefficient with refugee inflows is 0.0631, for victimization rates −0.0472, and for the victimization rate of Germans −0.0714.

[14]Data on both compositional features of regional refugee populations stem from special data extracts drawn the Statistic on Asylum Seekers' Benefits (SASB), provided for this project by the 16 Statistical Offices of the German Lander. Details on these special data extracts are provided in Section 3.1. 22 counties in the SASB data lack information on refugee sex ratios, and 2 counties lack information on decentralized refugee accommodation. Counties with missing information are colored white in the two maps in Figure 4. Positive county values for each measure are classified once more into 4 quartiles (the darker the color of a county, the larger is the change in a compositional feature), and negative county values are indicated by a light grey shading.

FIG. 3: County-level changes in asylum seekers, crime rates, total victimization rates, and rates of victimization of Germans, 2014-15
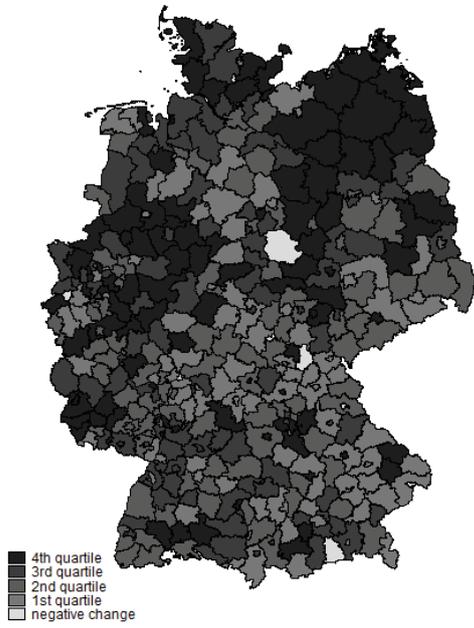
(a) Asylum seekers
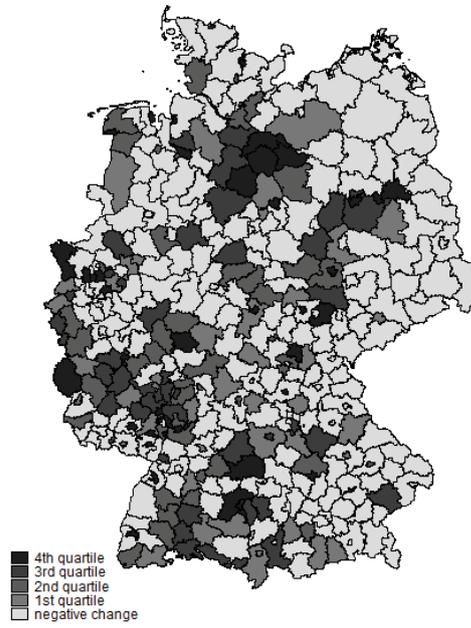
(b) Crimes
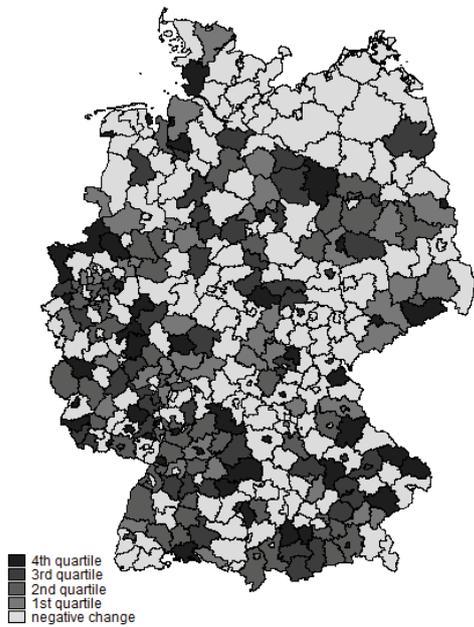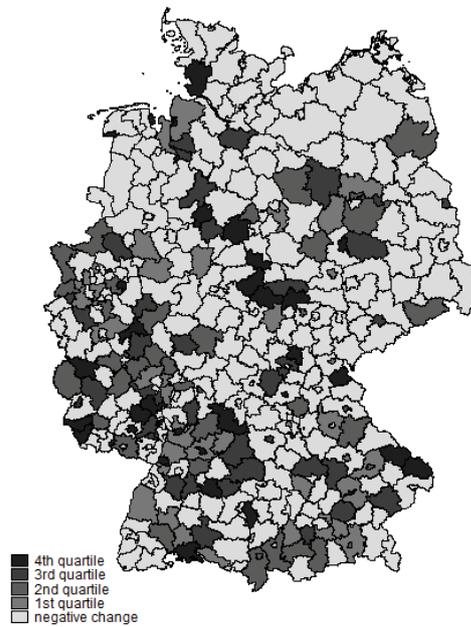
(c) Victims

(d) German victims

shown in Figure 3.[15] Being the port of entry to Germany for most refugee arrivals in 2015, it is remarkable, if not surprising, that the south-eastern federal state of Bavaria housed less refugees in group quarters in 2015 than in 2014, both overall and in most of its counties.

Fig. 4: County-level changes in refugee sex ratios and refugee decentralized accommodation, 2014-2015

(a) Refugee sex ratios (15 - 39) (b) Refugee decentralized accommodation
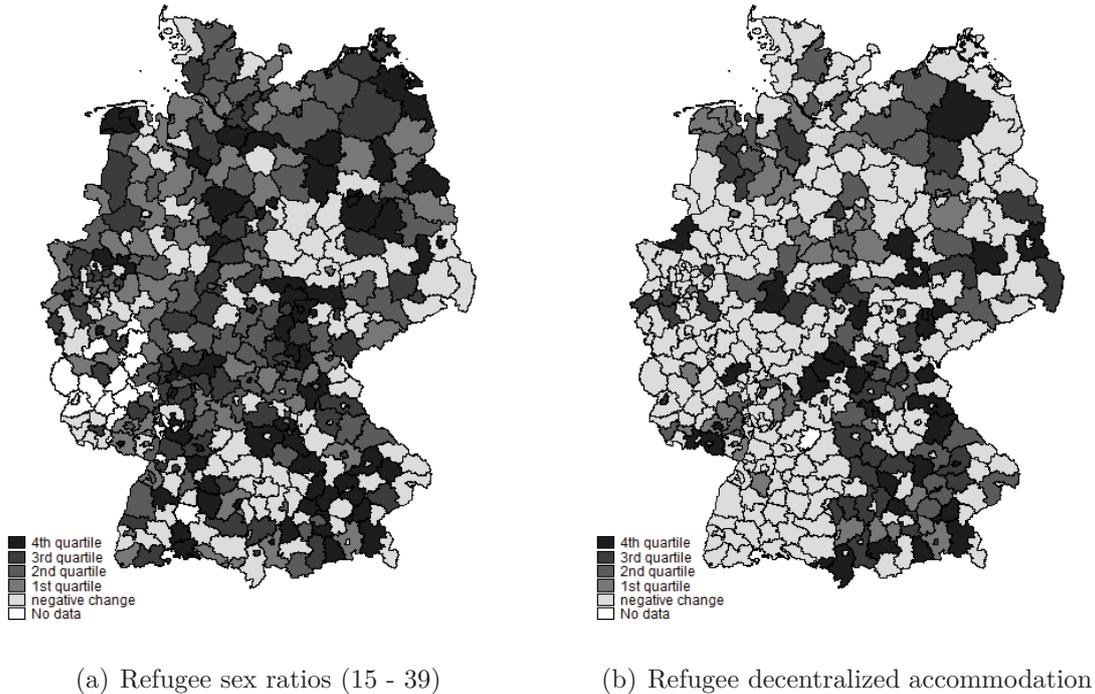
Unconditional bivariate correlations, as those studied in Figures 3 and 4, of course, may hide more than they reveal if the underlying data-generating process is multivariate in nature. We therefore now turn to regression analysis and the control of various time-variant observables and time-invariant unobservables that may confound the relationship between regional refugee inflows (and their composition) and changes in criminal activity. In the next section, we introduce and describe in detail the data we use for this purpose and outline our empirical strategy.

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[15]The correlation coefficient between county-level changes in refugee sex ratios and decentralized refugee accommodation is -0.0369. The correlation coefficient between county-level changes in asylum seeker populations and refugee sex ratios (decentralized refugee accommodation) is -0.0260 (-0.1325). Correlation coefficients between changes in refugee sex ratios, respectively decentralized refugee accommodation, and changes in crime rates, population victimization rates, and rates of victimization of Germans are 0.0245, -0.0465, and -0.0215, respectively -0.1736, 0.0321, and 0.0538. All reported correlation coefficients are for the 378 counties with non-missing data on refugee sex ratios and decentralized refugee accommodation.

3 Data and Empirical Strategy

3.1 The Data

For our first-difference regression analyses of regional refugee inflows (and their composition) and regional changes in criminal activity, we use two high-quality administrative data sources. First, county-level crime data from the PCS of the BKA, including special PCS data extracts provided by the BKA for this research project. And second, county-level refugee data from the SASB and special data extracts thereof, provided to us by the 16 Statistical Offices of the German Lander. In the following, we document these data sources in detail and describe the variables we construct from them.

The Police Crime Statistic (PCS) provides annual statistics on recorded crimes (offenses), suspects, and victims.[16] In our regression analysis, we will use county-level PCS statistics for the years 2013 to 2016. Crimes are classified in the PCS by 6-digit crime keys. In the crime statistics, summary crime key 890000 denotes all crimes excluding violations of the Residence Act, the Asylum Act and the Freedom of Movement Act E.U. (crime key: 725000).[17] We use offenses covered by crime key 890000 for the construction of county-level crime rates. For 2015, the PCS records a total of 5,927,908 crimes that do not constitute violations of the Residence Act, the Asylum Act and the Freedom of Movement Act E.U. (i.e., offenses against foreigners law). Suspects are recorded in the PCS for solved (cleared-up) crimes, i.e. offenses for which a suspect was caught in the act or the identity of a suspect has been established through police investigations (BKA, 2016, p 80). A suspect is recorded only if police investigations have produced substantive evidence that a person is likely to have committed an offense. For 2015, the PCS provides information on 2,011,898 suspects. Refugee suspects are identified by their residence status and include asylum applicants, individuals with temporary suspension of deportation (*"Duldung"*), and quota or civil war refugees. Victim data are recorded (and reported in the PCS) only for natural persons and certain crimes. According to the *Catalogue of Definitions* of the BKA, victims are "persons injured/directly affected by specially defined violations of highly personal legally protected interests (life, physical integrity, freedom, reputation, sexual self-determination) and offenses involving resistance" (BKA, 2017, p. 9), provided the *Catalogue of Offences*

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[16]The PCS is compiled from individual data sets held at the Lander Criminal Police Offices (LKAs) (*"Landeskriminalämter"*) and the BKA.

[17]Crime key 725000 covers offenses such as unauthorized entry (border crossing), unauthorized stay, commercial and gang-type suboration of fraudulent application for asylum, provision of incorrect or incomplete information, or the fraudulent use of residence permits in legal transactions, entry (border crossing), or stay despite being refused freedom of movement (BKA, 2018, p. 35-36).

of the BKA contains a mark for victim recording. Offences linked with crime keys areas[18] 0000** (offenses against life), 1000** (offenses against sexual self-determination), 2000** (offenses involving brutality and crimes against personal freedom), and 6210** (resistance to public authority) are, as a rule, victim-related (BKA, 2017). In 2015, a total of $946,133$ victims were recorded in the PCS. Crimes with victim recording account for a sizable fraction of all crimes (14.1% in 2015) and cover offenses that have been of prime concern to the public and also covered prominently in the media, such as bodily injuries, robberies, and sex crimes.[19] Since 2013, victim data collected for the PCS contain information also on the nationality of victims. Based on this information, county-level data on the number of German victims and data on the number of German victims in crimes with refugee suspects can be extracted from raw PCS files held at the BKA. For this research project, we have obtained such data in the form of special PCS data extracts from the BKA. Such data are not provided in published official PCS statistics or BKA reports and have not been used in prior research on (refugee) immigration and crime. From the PCS data, we construct three county-level outcome measures (for a county c in state s), the 2014-2015 (respectively 2014-2016) change in the crime rate, the victimization rate, and the rate of victimization of Germans in crimes with refugee suspects ($\Delta crimerate_{cst}$, $\Delta victimrate_{cst}$ and $\Delta Gvictimrate_{cst}$ for $t = 2015, 2016$). The first two are measures of total crime (incidence) and are standardly used in the literature (we use these as a point of reference and benchmark); the last is our prime (and novel) outcome measure and captures changes in refugee crimes against Germans. The county-level crime rate (victimization rate) is defined as the total number of crimes (victims) in a county and year, normalized by the pre-crisis population of the county in 2014.[20] Our key outcome variable, the victimization rate of Germans in crimes with refugee suspects, is defined as the number of German victims in crimes with refugee suspects in a county and year, normalized by the pre-crisis German population of the county in 2014. As discussed in Sections 1 and 2.2, for analyses of natives' victimization by immigrants, such a measure is methodologically superior to measures standardly used in the literature on (refugee) immigration and crime, such as overall crime and victimization rates, which are susceptible to potential bias arising from confounding but unobserved responses in other forms of crime (victim-suspect combinations). Despite this clear advantage, measures of rates of victimization of natives by immigrants have not been used in the national or international

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[18](**) in the last two digits of these keys are placeholders for key sub-categories.

[19]Bodily injuries comprise, amongst others, bodily injuries that result in death, dangerous and serious bodily injuries, and intentional simple bodily injuries. Robberies, i.e., the unlawful taking of property from others by means of force or intimidation, include handbag robbery, robbery in residences, as well as robberies in streets, lanes or public places. Sex crimes cover rape and other forms of sexual coercion.

[20]We normalize crime and victim counts by pre-crisis county populations, as post-crisis populations are potentially endogenous and also affected by refugee inflows during the crisis.

literature on immigration and crime. In our first-difference regression analyses, we consider as outcomes changes between 2014 and 2015 (or 2016) in these three measures of criminal activity at county level, both overall and for selected sub-groups of crime.

The second data source, the Statistic on Asylum Seekers' Benefits (SASB), is an administrative end-of-year (EoY) public registry with full coverage of all refugees who seek asylum and receive such benefits in Germany.[21] Other data sources used in the literature to quantify refugee inflows during the 2015 crisis, such as the Central Register of Foreigners (CRF), lack such full coverage (for details, see Section 2.1). We use county- and municipality-level data from the SASB on EoY county-level asylum seeker populations, their demographic composition and housing in the years 2013 to 2015. Information on county-level sizes of asylum seeker populations is available online for download from the website of the Federal Statistical Office of Germany, all other SASB data, at county or municipality level, are special SASB data extracts we obtained from the 16 Statistical Offices of the German Lander. At county level, the data extracts provide information on the EoY number of refugees (total and male refugees) in a county who are aged 15 to 39 and the number of refugees who are living in decentralized accommodation. For data protection reasons, data extracts at the municipality level are confined to binary information on the EoY operation in a municipality of refugee reception centers or group quarter accommodation facilities.[22] The key explanatory variable we construct from our SASB data is measured at county level, the 2014-2015 change in the EoY population size of asylum seekers in a county c in state s normalized by the 2014 population of county c ($\Delta refugees_{cs2015}$). In addition to this measure of 'excess' refugee inflows to a county that were caused by the 2015 refugee crisis, we also construct, from our special SASB data extracts, variables for changes at county level between 2014 and 2015 in the male-to-female sex ratio of refugees aged 15-39 ($\Delta sexratio_{cs2015}$) and the share of asylum seekers who are housed in decentralized accommodation ($\Delta decentralized_{cs2015}$). Both compositional measures, hitherto unused in analyses of (refugee) immigration and crime for Germany, may matter independently for crime development and are hence of great policy interest, in particular as public refugee distribution policies can easily be tailored to and targeted at these measures. Information on both the gender-age structure of county refugee populations and their type of accommodation is recorded in the SASB (special data extracts) only for 378 counties. Analyses in which we consider these compositional features are hence

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[21]The SASB records annually all asylum seekers in Germany who on the 31st of December receive some kind of regular financial or other support from public authorities under the Act on Benefits for Asylum Seekers (*"Asylbewerberleistungsgesetz"* (AsylbLG)) (Statistisches Bundesamt, 2015).

[22]We use pre-crisis 2014 municipality-level information from the SASB (aggregated to the county level) for the construction of instrumental variables for changes in county-level refugee populations from 2014 to 2015, i.e. during the 2015 refugee crisis (see Section 3.2 for details).

based on a restricted sample of 378 counties (rather than the full sample of all 402 counties in Germany).

In addition to our main explanatory variable, the 2014-2015 change in the county-level EoY stock of asylum seekers, and 2014-2015 changes in associated county-level SASB statistics, i.e. the male-to-female sex ratio among refugees aged 15-39 and the share of asylum seekers in decentralized accommodation, we will consider in our regression analysis also several controls, measured pre crisis (in levels or changes), for factors that may have influenced the regional development of asylum seeker populations between 2014 and 2015 and of crime between 2014 and (post-)crisis years 2015 and 2016. In our baseline specifications, these factors include the 2013 to 2014 change in the crime rate of county c in state s ($\Delta crimerate_{cs2014}$) and the 2013 to 2014 (approximate) growth rate of its population ($\Delta \ln(pop)_{cs2014}$), county-level log GDP per capita in 2014 ($\ln(GDP)_{cs2014}$), and the 2014 unemployment rate of a county ($unemployment_{cs2014}$). In all regressions, we control also for state fixed effects (to account for state-wide trends). In sensitivity analyses, we furthermore consider the 2014 crime clearance rate[23] ($clearancerate_{cs2014}$) at county level, a proxy for the risk of being arrested for a crime (and hence the effectiveness of law enforcement and its crime deterring effect) at regional level, and the administrative 'city-county' (*"Stadtkreis"*) status of counties ($citycounty_{cs2014}$), a measure of county urbanity. A detailed discussion of these additional covariates is provided in Section 5.1.

Selected summary statistics for our full estimation sample, which consists of 402 county observations on county-level changes in criminal activity between 2014 and 2015 (2016), county-level changes in refugee inflows (and their compositions) between 2014 and 2015, and pre-crisis differences (in 2014 levels or in 2013-2014 changes) between counties in crime, demographics, and economic prosperity, are provided in Table 1 below. For our restricted estimation sample (378 counties), which contains information also on compositional features of county-level refugee populations, Table 1 reports also summary statistics for county-level changes in male-to-female sex ratios of refugees aged 15-39 and in the shares of asylum seekers who are housed in decentralized accommodation.

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[23]The clearance rate is the ratio of cleared offenses to recorded offenses during a year. The clearance rate in a year may exceed 100%, if offenses from previous years are cleared only in the current year.

TABLE 1: Selected summary statistics for full estimation sample

	Observations	Mean	Std. Dev.	Min	Max
Panel A: Measures of Crime Incidence:					
$\Delta crimerate_{cs2015}$	402	-0.0005	0.0048	-0.0190	0.0210
$\Delta crimerate_{cs2016}$	402	-0.0007	0.0058	-0.0316	0.0278
$\Delta victimrate_{cs2015}$	402	0.00001	0.0009	-0.0052	0.0036
$\Delta victimrate_{cs2016}$	402	0.0009	0.0011	-0.0028	0.0063
$\Delta Gvictimrate_{cs2015}$	402	0.0001	0.0001	-0.0002	0.0009
$\Delta Gvictimrate_{cs2016}$	402	0.0003	0.0002	-0.0002	0.0014
Panel B: Refugee Immigration:					
$\Delta refugees_{cs2015}$	402	0.0076	0.0064	-0.0043	0.0739
$\Delta sexratio_{cs2015}$	378	0.2234	2.2191	-28.2691	10.6769
$\Delta decentralized_{cs2015}$	378	-0.0380	0.1574	-0.7872	0.5775
Panel C: Pre-Crisis County Characteristics:					
$\Delta crimerate_{cs2014}$	402	0.00003	0.0040	-0.0180	0.0161
$\Delta \ln(pop)_{cs2014}$	402	0.0038	0.0060	-0.0185	0.0240
$\ln(GDP)_{cs2014}$	402	10.3537	0.3438	9.6121	11.8243
$unemployment_{cs2014}$	402	6.2796	2.8822	1.4000	15.4000

Notes: The table shows selected summary statistics for the full estimation sample which consists of the 402 counties in Germany. Variables measure changes (e.g., between 2014 and 2015, or 2014 and 2016) or levels (e.g., in 2014) for these 402 counties (c) in the 16 federal states (s) in Germany. $\Delta(\cdot)_{cs2015}$ indicates the change (in the value) of a variable from 2014 to 2015, and $\Delta(\cdot)_{cs2014}$ indicates the change in its level from 2013 to 2014. Summary statistics for changes in male-to-female sex ratios of refugees aged 15-39 ($\Delta sexratio_{cs2015}$) and shares of asylum seekers who are housed in decentralized accommodation ($\Delta decentralized_{cs2015}$) are for a restricted sample of 378 counties with non-missing information on both compositional features of county-level refugee populations. For a description of all variables and the data sources used to construct them, see main text.

3.2 Empirical Strategy

To study the effect that excess refugee inflows during the 2015 refugee crisis had on crime, we estimate variants of the following first-difference model:

$$\Delta Y_{cst} = \alpha + \beta \Delta refugees_{cs2015} + \boldsymbol{X}'_{\boldsymbol{cs2014}} \, \boldsymbol{\gamma} + \boldsymbol{\delta_s} + \varepsilon_{cst},$$

where ΔY_{cst} denotes the change in a crime or victimization rate for county c in state s between pre-crisis period 2014 and crisis period 2015 ($t = 2015$) or post-crisis period 2016 ($t = 2016$), and $\Delta refugees_{cs2015}$ denotes the change between 2014 and 2015 in the EoY population stock of asylum seekers in county c in state s normalized by county c's pre-crisis population in 2014. $\boldsymbol{X_{cs2014}}$ is a vector of control variables for pre-crisis characteristics of county c, $\boldsymbol{\delta_s}$ is a set of state dummies, and ε_{cst} is an error term. Correlating outcomes and asylum seeker populations in first differences rather than in levels allows us to control for time-invariant (un-

)observable factors that may be correlated with Y_{cst} and $refugees_{cst}$, such as persistent level differences between counties in demographic, economic, or geographic factors, or in crime levels, crime types, crime recording, and specific suspect-victim combinations in regional crime. As EoY asylum seeker populations approximate annual inflows of asylum seekers, such correlations also restrict the focus on 'excess' crime that may have been caused by 'excess' refugee inflows during the refugee crisis in 2015. Mere unconditional correlations of outcomes and asylum seeker populations in first differences, however, may still be confounded by pre-crisis county characteristics if such characteristics correlate with changes in criminal activity and refugee inflows over time. The use of several controls (contained in $\boldsymbol{X_{cs2014}}$) for pre-crisis differences between counties in economic performance and recent trends in crime and population growth seeks to account for such potentially confounding influences, as does the inclusion of a set of state dummies $\boldsymbol{\delta_s}$ to control for state-specific common components in the change of criminal activity at county level within states.[24] Parameter β, the coefficient of prime interest, hence captures within-state variation across time in criminal activity that is linked to within-state variation in excess refugee inflows during the refugee crisis.

The key identifying assumption for a causal interpretation of β is that there is no unobserved factor that drives both regional refugee inflows during the 2015 refugee crisis and regional changes in criminal activity between 2014 and 2015. For several reasons, the scope for such potentially confounding selection of refugees is arguably minor. First, refugees were allocated by public authorities to different states based on a pre-defined federal allocation quota (the "Königstein Key"), and then within states by state authorities to particular counties. Second, refugees remained for considerable time restricted to the region they first had been assigned to (see Section 2.1 for details). These administrative regulations, which governed the spatial distribution of refugee arrivals, severely limited the regional mobility of refugees, and thereby also the scope for potential and systematic self-selection of refugees into certain regions that could bias our results. The use of state fixed effects $\boldsymbol{\delta_s}$ in our first-difference regression framework controls for common state components in county level changes within states, as may be caused, amongst others, by state quotas set by the "Königstein Key". Within-state allocation rules to counties differed somewhat between states, but generally took reference only to county populations (this does not apply for the three city states Berlin, Hamburg and Bremen), and in few instances also to county areas.

However, in the event, urgency, bare need, and capacity considerations are likely to have played a role too, as large number of refugees had to be accommodated at short notice (often within days, if not hours) in the heyday of the 2015 refugee crisis. What is more,

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[24]$\boldsymbol{X_{cs2014}}$ includes the 2013 to 2014 change in the crime rate of a county and the (approximate) growth rate of its population, county-level GDP per capita in 2014, and the 2014 unemployment rate of a county.

refugees, at least in part, might have been able to choose by feet and on their own account a state before declaring to public authorities their intend to apply for asylum. We deal with these (remaining) threats to identification in two main ways. First, we control in our regression analysis for pre-crisis differences between counties in GDP per capita and rates of unemployment as well as differences in crime development and population growth just prior to the crisis. We also show in placebo regressions which predate all variables by one year, except for our county-level refugee inflow measure, that conditional on these covariates, changes in refugee inflow rates from 2014 to 2015 are unrelated to regional crime development before the 2015 refugee crisis that would invalidate our findings. Second, we use the 2014 pre-crisis location of refugee reception centers and their aerial distance to population-weighted centroids of counties located within the same federal state as an instrument for county-level refugee inflows between 2014 and 2015. Specifically, we use as IV in 2SLS regressions the logarithm of the 2014 average distance in kilometers (plus one) between county c and all counties within the same state s as county c that in 2014 host a refugee reception center $(\log(dist_{cs2014} + 1))$.[25] These 2SLS regressions hence exploit for identification only intra-state variation between counties in expellee inflow rates that is attributable to the pre-crisis number and location of state reception centers in a state and related (predetermined) allocation mechanisms of state and sub-state authorities governing the regional distribution of refugees for the routes refugees were to take along the stages of their asylum procedure in the second half of 2015 (see Section 2.1). As public authorities where caught by surprise by the immense scale of refugee arrivals, and existing capacities of reception centers in late 2015 became rapidly exhausted, emergency shelters and affiliated reception facilities had to be opened at short notice and in large numbers (Bundesregierung, 2015a). Such openings occured often in the vicinity of established reception centers that had existed already in 2014, which permitted their incorporation into (and utilization of) the pre-crisis infrastructure for the allocation of refugees and the processing of their asylum applications in accordance with the set-out stages of the asylum procedure. This regional pattern of openings hence gives rise to a systematic and negative association between the average distance of a county to counties within the same state that in 2014 host a refugee reception center and county-level refugee inflows between 2014 and 2015. The IV we use is relevant, and also arguably valid.[26] The pre-crisis location of refugee reception centers and their aerial distances to population-weighted centroids of counties located within the same federal state are pre-determined, and while their pre-crisis location may well be correlated with unobserved (time-invariant)

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[25]If county i itself had a reception center in 2014, we set $dist_{cs2014}$ equal to 0.

[26]The first-stage results show that we do not have a weak instrument problem and that $\log(dist_{cs2014} + 1)$ is negatively correlated, as expected, with $\Delta refugees_{cs2015}$ (see column (1) of Table 7 in Section 5.1).

confounders affecting county-level crime levels, their regional distribution before the crisis arguably should affect (conditional on covariates) changes in crime in our first-difference specification only through 'excess' refugee inflows during the crisis. As we will see, our core finding of a lack of evidence for a greater victimization of Germans in crimes with refugee suspects in counties with larger 'excess' refugee inflows during the crisis year 2015 proves robust to the use of just such exogenous intra-state variation in refugee inflows for identification.

The next two sections present our results for total crime, the standard in the literature on immigration and crime, and refugee crimes against Germans, as measured by the rate of victimization of Germans in crimes with refugee suspects. We consider first total crime, i.e. total crime and victimization rates (in Section 4), and then the rate of victimization of Germans in crimes with refugee suspects (in Section 5). Because of its greater informational content for the research question studied, more emphasis (and space) will be devoted to the latter outcome measure.

4   Results for Total Crime

Table 2 provides results from estimating our first-difference model by OLS, using two different outcome measures and two different specifications. Columns (1) and (2) consider the total crime rate, columns (3) and (4) the total victimization rate. Specifications in columns (1) and (3) assume that changes in crime, respectively victimization, and refugee inflows are linearly related, whereas specifications in columns (2) and (4) allow for non-linearities by adding a quadratic of (the change in) the county-level rate of refugee inflows. All regressions control for state fixed effects, the 2013 to 2014 change in the crime rate of a county and the (approximate) growth rate of its population, county-level GDP per capita in 2014, and the 2014 unemployment rate of a county.

In the linear specification, refugee inflows do not exert a statistically significant effect on the crime rate. The same holds true in the linear specification which considers the total victimization rate. If one allows for non-linearities (i.e., a more flexible specification), however, things are different. Refugee inflows now exert a statistically significant and hump-shaped effect on both crime and victimization rate. Evaluating the marginal effect of refugee inflows at the sample mean of county-level refugee inflows, a one standard deviation increase in refugee inflows raises the county-level crime rate by 0.0010 ($= 0.1636 \times 0.0064$), or 1.67% from the level it had in 2014, and the county-level victimization rate by 0.0002 ($= 0.0383 \times$

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TABLE 2: Refugee immigration and changes in crime rates and victimization rates at county level between 2014 and 2015 (OLS regression results)

	$\Delta crimerate_{cs2015}$		$\Delta victimrate_{cs2015}$	
	(1)	(2)	(3)	(4)
$\Delta refugees_{cs2015}$	0.0427	0.2075**	−0.0053	0.0542***
	(0.0331)	(0.0804)	(0.0070)	(0.0167)
$\Delta refugees^2_{cs2015}$		−2.8888**		−1.0440***
		(1.2853)		(0.2664)
$\Delta crimerate_{cs2014}$	−0.3783***	−0.3855***	−0.0351***	−0.0377***
	(0.0548)	(0.0546)	(0.0115)	(0.0113)
$\Delta \ln(pop)_{cs2014}$	0.1596***	0.1570***	0.0153*	0.0143
	(0.0431)	(0.0429)	(0.0090)	(0.0089)
$\ln(GDP)_{cs2014}$	0.0002	0.0002	−0.0003*	−0.0003*
	(0.0008)	(0.0008)	(0.0002)	(0.0002)
$unemployment_{cs2014}$	0.0003**	0.0003***	−3.48e−06	6.46e−06
	(0.0001)	(0.0001)	(2.55e−05)	(2.52e−05)
observations	402	402	402	402
mean of dep. var. 2014	0.0627	0.0627	0.0108	0.0108

Notes: The dependent variable in columns (1) and (2) is the change in the total number of crimes in a county (excluding violations of the Residence Act, the Asylum Procedures Act, and the Freedom of Movement Act/E.U.) between 2014 and 2015, normalized by the county's 2014 population. The dependent variable in columns (3) and (4) is the change in the total number of victims in a county between 2014 and 2015, normalized by the county's 2014 population. All regressions control for state fixed effects, the 2013 to 2014 change in the crime rate of a county and the (approximate) growth rate of its population, county-level GDP per capita in 2014, and the 2014 unemployment rate of a county. *, **, *** denote statistical significance at the 10%, 5% and 1% level.

0.0064), an increase of 2.27% on its 2014 value.[27] Other covariates prove less consistent in their estimated effects (in terms of sign and magnitude) across the two specifications and two outcome measures considered, with one exception, the 2013 to 2014 change in the crime rate of a county ($\Delta crimerate_{cs2014}$). Its estimated coefficient is throughout negative and highly statistically significant. Mean reversion in criminal activity may explain this negative correlation between past and current changes in crime and victimization rates.[28]

For 378/402 (94%) counties, our data records not only the magnitude of refugee inflows but also the importance of decentralized refugee accommodation and imbalances in sex ratios among prime-aged refugee inflows. Men tend to be more prone to crime than women, and (de-)centralized accommodation of refugees may be of consequence for the scale and type of

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[27]Graphs (a) and (b) in Figure A-1 in the Appendix show that the predicted change in the crime rate is largest (and the marginal effect of excess refugee inflows becomes zero) when $\Delta refugees_{cs2015}$ reaches about 0.035, a very high value (only 4/402 counties from four federal states in our sample witness increases exceeding this threshold). Excluding these top 1% of counties from our sample, and re-estimating our non-linear specification in column (2), shows that the hump-shaped effect we found depends crucially on these influential observations (estimation results are available from the authors upon request). Panels (c) and (d) in Figure A-1 in the Appendix, which show the respective plots for the victimization rate, indicate that the hump-shaped effect of $\Delta refugees_{cs2015}$ on the victimization rate is also driven by a small number of high-exposure counties.

[28]Responses in law enforcement to changes in crime prevalence provide an alternative, and potentially complementary, explanation.

TABLE 3: Refugee immigration, refugees' gender and housing structure, and changes in crime rates and victimization rates at county level between 2014 and 2015 (OLS regression results)

Panel (A):	$\Delta crimerate_{cs2015}$ (mean $crimerate_{cs2014}$: 0.0627)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta refugees_{cs2015}$	0.0366	0.1944**	0.0283	0.1750**	0.0284	0.1754**
	(0.0340)	(0.0866)	(0.0341)	(0.0871)	(0.0342)	(0.0873)
$\Delta refugees^2_{cs2015}$		−2.6728**		−2.4720*		−2.4775*
		(1.3509)		(1.3523)		(1.3547)
$\Delta decentralized_{cs2015}$			−0.0029*	−0.0026*	−0.0029*	−0.0026*
			(0.0015)	(0.0015)	(0.0015)	(0.0015)
$\Delta sexratio_{cs2015}$					9.06e−06	1.41e−05
					(9.83e−05)	(9.80e−05)
$\Delta crimerate_{cs2014}$	−0.3328***	−0.3398***	−0.3279***	−0.3348***	−0.3279***	−0.3348***
	(0.0566)	(0.0565)	(0.0565)	(0.0564)	(0.0566)	(0.0565)
$\Delta\ln(pop)_{cs2014}$	0.1733***	0.1713***	0.1651***	0.1639***	0.1651***	0.1639***
	(0.0439)	(0.0437)	(0.0440)	(0.0438)	(0.0440)	(0.0439)
$\ln(GDP)_{cs2014}$	−0.0005	−0.0005	−0.0006	−0.0006	−0.0006	−0.0006
	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
$unemployment_{cs2014}$	0.0003**	0.0003***	0.0003**	0.0003**	0.0003**	0.0003**
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)

Panel (B):	$\Delta victimrate_{cs2015}$ (mean $victimrate_{cs2014}$: 0.0108)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta refugees_{cs2015}$	−0.0081	0.0498***	−0.0073	0.0524***	−0.0075	0.0519***
	(0.0071)	(0.0179)	(0.0072)	(0.0181)	(0.0072)	(0.0181)
$\Delta refugees^2_{cs2015}$		−0.9802***		−1.0075***		−1.0018***
		(0.2797)		(0.2807)		(0.2810)
$\Delta decentralized_{cs2015}$			0.0003	0.0004	0.0003	0.0004
			(0.0003)	(0.0003)	(0.0003)	(0.0003)
$\Delta sexratio_{cs2015}$					−1.68e−05	−1.48e−05
					(2.07e−05)	(2.03e−05)
$\Delta crimerate_{cs2014}$	−0.0289**	−0.0315***	−0.0294**	−0.0322***	−0.0294**	−0.0322***
	(0.0119)	(0.0117)	(0.0119)	(0.0117)	(0.0119)	(0.0117)
$\Delta\ln(pop)_{cs2014}$	0.0145	0.0138	0.0153*	0.0148	0.0153*	0.0148
	(0.0092)	(0.0091)	(0.0092)	(0.0091)	(0.0093)	(0.0091)
$\ln(GDP)_{cs2014}$	−0.0004**	−0.0004**	−0.0004**	−0.0004**	−0.0004**	−0.0004**
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
$unemployment_{cs2014}$	−1.14e−05	−5.71e−07	−9.32e−06	2.57e−06	−8.52e−06	3.21e−06
	(2.58e−05)	(2.56e−05)	(2.59e−05)	(2.57e−05)	(2.60e−05)	(2.58e−05)

Notes: The table shows regressions results for the restricted estimation sample of 378 counties with non-missing information on county-level sex ratios of refugees aged 15-39 and county-level shares of refugees who are housed in decentralized accommodation. Panel (A) reports results for the county-level crime rate, Panel (B) for the county-level victimization rate. Columns (1) and (2) consider our baseline covariates used in Table 2, columns (3) and (4) add to this set of controls the change between 2014 and 2015 in the share of asylum seekers who are housed in decentralized accommodation in a county ($\Delta decentralized_{cs2015}$), and columns (5) and (6) add in addition also the change at county level between 2014 and 2015 in the male-to-female sex ratio of refugees aged 15-39 ($\Delta sexratio_{cs2015}$). *, **, *** denote statistical significance at the 10%, 5% and 1% level.

criminal activity. Changes in these compositional features of regional refugee populations hence might exert an independent effect on the regional evolution of rates of crime and victimization. As regional age-gender compositions and housing structures can be directly targeted and steered by policy, it is of great interest to state and local authorities charged with the distribution and housing of refugee arrivals, whether any of the two matters for

crime levels. Because of a lack of data, existing studies have largely ignored this question. Given our special data extracts, however, we can study both features and their impact. Table 3 provides results from re-estimating our first differences models with an expanded set of covariates that includes also measures for changes at county level between 2014 and 2015 in the sex ratio of male to female refugees aged $15 - 39$ ($\Delta sexratio_{cs2015}$) and the share of refugees that are housed decentrally, rather than in group quarters, in a county ($\Delta decentralized_{cs2015}$). Panel (A) of Table 3 shows results for the crime rate, Panel (B) for the total victimization rate. Both as a check and as a point of reference, columns (1) and (2) show results from re-estimating our two baseline specifications for the reduced sample of the 378 counties with complete information on refugee inflows, accommodation, and sex ratios. They prove identical to those from our full sample. Columns (3) and (4) report results when adding $\Delta decentralized_{cs2015}$ to the set of covariates, and columns (5) and (6) report results when considering also $\Delta sexratio_{cs2015}$. As is evident, our main findings for the size of refugee inflows and its impacts remain unchanged with all expanded sets of covariates. Of no effect in the linear specifications, they exert a statistically significant and hump-shaped effect on both the rate of crime and the rate of victimization in the non-linear specifications (columns (4) and (6)). The gender composition of regional refugee populations, in contrast, proves irrelevant for crime as well as victimization rates in both specifications and for all sets of covariates. However, the share of refugee populations in decentralized accommodation shows a significant negative association with crime (albeit not victimization) rates, both in the linear and in the non-linear specifications. Housing policies that favor decentralized over centralized accommodation may therefore have a crime-reducing effect. Without additional information on suspects and victims, however, i.e., their refugee status, respectively nationality, the causes and the nature of such potential gains, and their prime beneficiaries, inevitably remain unclear.

What (policy) conclusions can then be drawn from the above analysis? For the research question of prime interest in this study, we think, few, if any. From a methodological perspective, analyses of total crime incidence, as measured by the total crime rate, the total victimization rate, or variants thereof, are simply ill-suited to explore, and identify, the causal effects of refugee immigration on the risk of natives to become victimized in crimes committed, or allegedly committed, by refugees. As argued in Section 1, systematic associations between immigration and measures of total crime incidence, such as the hump-shaped relationships we found in the above analysis, may have multiple and confounding causes, including changes in crime incidence exclusively among natives or among refugees, or changes in anti-refugee crimes by natives if these are affected by refugee immigration too. As a consequence, little, if anything, can be learned about the change in harm done to

natives by refugees from such crude measures of crime incidence.

In the following, and in the remainder of this study, we hence focus on a more restrictive, and more suitable, measure of crime incidence, the rate of victimization of Germans in crimes with refugee suspects. This measure, as yet unused in the literature, does not suffer from any of the above potential responses in other types of crime and is hence clearly superior methodologically for the analysis of refugee crimes against natives, which are at the heart of public concerns about refugee immigration and the focus of this study. As we will see, its use, or lack of use, also does make a material difference.

5 Results for Refugee Crime Against Germans

In this section, and in the analyses that follow, we turn to the study of (changes in) county-level victimization rates of Germans in crimes with refugee suspects and how such risks of falling victim to alleged refugee crimes were affected by spatial-temporal variation in county-level inflows of refugees because of the 2015 refugee crisis. The dependent variable we consider for this purpose is the change from 2014 to 2015 in the county-level number of Germans victimized in crimes with at least one refugee suspect, normalized by a county's pre-crisis German population in 2014.

Table 4 provides for this restricted crime measure OLS estimation results of our first-difference model. As for total crimes before, we consider two alternative specifications. The first (column (1)) assumes that changes in the victimization rate of Germans in crimes with refugee suspects and changes in refugee inflows are linearly related, the second (column (2)) allows for non-linearities in the relationship by adding a quadratic of the change in the county-level rate of refugee inflows. All regressions again control for state fixed effects, the 2013 to 2014 change in the crime rate of a county and the (approximate) growth rate of its population, county-level GDP per capita in 2014, and the 2014 unemployment rate of a county.

As is evident, in both specifications, refugee inflows do not exert a statistically significant effect on the victimization rate of Germans in crimes with refugee suspects. There is thus no indication that Germans were put at higher risk of victimization by refugees when refugees settled in greater numbers in their county of residence in the wake of the 2015 refugee crisis. This finding, which we show to prove robust in a battery of sensitivity checks, is of great importance, not only for policy and public opinion, but also for research on (refugee) immigration and crime in general. It illustrates, how the use of crude measures of crime incidence, such as the total crime and victimization rate, the standard measures employed in the literature on immigration and crime, may lead to biased inference when findings of their

TABLE 4: Refugee immigration and changes in the rate of victimization of Germans in crimes with refugee suspects at county level between 2014 and 2015 (OLS regression results)

	$\Delta Gvictimrate_{cs2015}$	
	(1)	(2)
$\Delta refugees_{cs2015}$	0.0007	0.0014
	(0.0009)	(0.0021)
$\Delta refugees^2_{cs2015}$		−0.0131
		(0.0342)
$\Delta crimerate_{cs2014}$	−0.0023	−0.0023
	(0.0014)	(0.0015)
$\Delta \ln(pop)_{cs2014}$	0.0034***	0.0034***
	(0.0011)	(0.0011)
$\ln(GDP)_{cs2014}$	0.0001***	0.0001***
	(0.0000)	(0.0000)
$unemployment_{cs2014}$	7.08e−06**	7.21e−06**
	(3.21e−06)	(3.23e−06)
observations	402	402
mean of dep. var. 2014	0.0001	0.0001

Notes: The dependent variable in columns (1) and (2) is the change in the total number of Germans victimized in crimes with refugee suspects in a county between 2014 and 2015, normalized by the county's 2014 German population. All regressions control for state fixed effects, the 2013 to 2014 change in the crime rate of a county and the (approximate) growth rate of its population, county-level GDP per capita in 2014, and the 2014 unemployment rate of a county. *, **, *** denote statistical significance at the 10%, 5% and 1% level.

analysis are taken as evidence for whether natives are harmed by (refugee) immigration.

Before probing the robustness of this key result, we explore (as done also for total crimes in Section 4), whether changes in rates of victimization of Germans in crimes with refugee suspects show any systematic link at county level to changes in refugee gender ratios and refugee accommodation structures in the restricted sample of counties for which we have information not only on county-level refugee inflows, but also on the age-gender compositions and housing structures of refugee populations. Table 5 reports the results of these explorations. As is evident, neither the size of refugee inflows, nor their age-gender structure and type of accommodation, exert a statistically significant effect. Again, a judgement solely based on evidence obtained from the analysis of crime and total victimization rates would have suggested otherwise. This underscores, once more, that the use of crude crime measures can lead to biased inference, misinformed public policy, and misled public opinion.

In the following, and for our full sample, we probe the robustness of our key finding in a number of sensitivity checks (Section 5.1) and investigate potential effect heterogeneity across different sub-categories of crime (Section 5.2).

TABLE 5: Refugee immigration, refugees' gender and housing structure, and changes in the rate of victimization of Germans in crimes with refugee suspects at county level between 2014 and 2015 (OLS regression results)

	$\Delta Gvictimrate_{cs2015}$ (mean $Gvictimrate_{cs2014}$: 0.0001)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta refugees_{cs2015}$	0.0004	0.0003	0.0005	0.0005	0.0004	0.0004
	(0.0009)	(0.0022)	(0.0009)	(0.0022)	(0.0009)	(0.0022)
$\Delta refugees^2_{cs2015}$		0.0015		-0.0011		0.0001
		(0.0341)		(0.0343)		(0.0342)
$\Delta decentralized_{cs2015}$			3.41e$-$05	3.43e$-$05	3.28e$-$05	3.28e$-$05
			(3.88e$-$05)	(3.90e$-$05)	(3.88e$-$05)	(3.90e$-$05)
$\Delta sexratio_{cs2015}$					-3.17e$-$06	-3.17e$-$06
					(2.47e$-$06)	(2.48e$-$06)
$\Delta crimerate_{cs2014}$	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010
	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)
$\Delta \ln(pop)_{cs2014}$	0.0030***	0.0030***	0.0031***	0.0031***	0.0032***	0.0032***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
$\ln(GDP)_{cs2014}$	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
$unemployment_{cs2014}$	5.80e$-$06*	5.78e$-$06*	6.07e$-$06*	6.08e$-$06*	6.22e$-$06**	6.22e$-$06**
	(3.09e$-$06)	(3.12e$-$06)	(3.11e$-$06)	(3.14e$-$06)	(3.11e$-$06)	(3.14e$-$06)

Notes: The table shows regressions results for the restricted estimation sample of 378 counties with non-missing information on county-level sex ratios of refugees aged 15-39 and county-level shares of refugees who are housed in decentralized accommodation. The dependent variable in columns (1) through (6) is the change in the total number of Germans victimized in crimes with refugee suspects in a county between 2014 and 2015, normalized by the county's 2014 German population. Columns (1) and (2) consider our baseline covariates used in Table 2, columns (3) and (4) add to this set of controls the change between 2014 and 2015 in the share of asylum seekers who are housed in decentralized accommodation in a county ($\Delta decentralized_{cs2015}$), and columns (5) and (6) add in addition also the change at county level between 2014 and 2015 in the male-to-female sex ratio of refugees aged 15-39 ($\Delta sexratio_{cs2015}$). *, **, *** denote statistical significance at the 10%, 5% and 1% level.

5.1 Robustness Checks

The refugee crisis, its onset and scale caught public authorities at surprise, and rules governing the regional distribution of refugee arrivals, while possibly observed at times in the breach, severely circumscribed the scope for potentially confounding endogenous self-selection of refugees into specific regions. From a methodological perspective, i.e., for identification and causal inference, these features are highly advantageous. Our selection-on-observables approach exploits these features in a first-difference regression framework that controls both for (unobserved) common confounders at state level and county-specific potential sources of endogeneity related to pre-crisis county heterogeneity in economic performance, crime development, and population growth. As argued in Section 3.2, however, there is still a risk that our first-difference estimates may suffer from omitted variable bias if refugees in the turmoil of the crisis had some (even if marginal) degree of freedom in their regional settlement or authorities departed from prescribed allocation rules because of bare need in the face of regionally varying constraints on housing capacity. In the following, we address these threats to identification in three ways and also probe the robustness of our findings to changes in the year we measure (post-)crisis outcomes.

First, we run a placebo regression which predates all variables (dependent and indepen-

dent) by one year, except for our county-level refugee inflow measure. Column (2) in Table 6 shows the main regression output of this exercise (to ease comparison, column (1) re-produces our baseline estimates from columns (1) and (2) in Table 4). In the linear specification (in Panel (A) of column (1)), changes in refugee inflow rates from 2014 to 2015 fail to show a negative correlation with regional crime development before the 2015 refugee crisis, and in the non-linear specification (in Panel (B) of column (1)), changes in refugee inflow rates from 2014 to 2015 are unrelated to regional crime development before the 2015 refugee crisis. Both findings continue to hold true when we predate only the dependent variable (column (3)) and exclude, in this alternative placebo regression specification, the 2013 to 2014 change in the crime rate from our set of covariates (column (4)). There is thus no indication that county-level refugee inflows during the refugee crisis were systematically and negatively correlated with pre-crisis trends in county-level rates of victimization of Germans in crimes with refugee suspects that could have biased our baseline OLS regression estimates towards the zero effect we found. The positive association in the linear specifications between pre-crisis changes between 2013 and 2014 in rates of victimization of Germans in crimes with refugee suspects and refugee crisis immigration between 2014 and 2015, however, suggests that the spatial-temporal variation in refugee inflows during the crisis was not altogether exogenous to pre-crisis county characteristics. We therefore, and in the remainder of the analysis, use IV regressions that exploit for identification only arguably exogenous county-level variation in refugee immigration during the crisis. For these, we use the linear specification from column (1) in Table 4 as our baseline model.

Second, we exploit the 2014 pre-crisis location of refugee reception centers and their aerial distance to population-weighted centroids of counties located within the same federal state as an instrument for refugee inflows between 2014 and 2015. Specifically, we use as an IV for $\Delta refugees_{cs2015}$ in a 2SLS regression the logarithm of the 2014 average distance in kilometers (plus one) between county c and all counties within the same state s as county c that in 2014 host a refugee reception center ($\log(dist_{cs2014} + 1)$). Column (1) of Table 7 shows the results for both the first and the second stage for our linear model specification. The first-stage results show that we do not have a weak instrument problem. In line with expectations, within-state refugee inflows to a county are larger, the closer a county is located to counties in the same state that house reception center facilities, and the F-statistic is well above 10. What is more, results for the second stage confirm our finding from OLS. Germans do not suffer higher risks of victimization when refugees settled in greater numbers in their county

TABLE 6: Refugee immigration and changes in the rate of victimization of Germans in crimes with refugee suspects at county level between 2013 and 2014 (OLS placebo regression results)

| | $\Delta Gvictimrate_{cs2015}$ | $\Delta Gvictimrate_{cs2014}$ | | |
	(1)	(2)	(3)	(4)
Panel (A):				
$\Delta refugees_{cs2015}$	0.0007	0.0012*	0.0011*	0.0011*
	(0.0009)	(0.0007)	(0.0007)	(0.0007)
Panel (B):				
$\Delta refugees_{cs2015}$	0.0014	0.0013	0.0009	0.0011
	(0.0021)	(0.0016)	(0.0016)	(0.0016)
$\Delta refugees_{cs2015}^2$	-0.0131	-0.0012	0.0039	0.0007
	(0.0342)	(0.0260)	(0.0258)	(0.0259)
observations	402	402	402	402
mean of dep. var. 2014	0.0001	0.0001	0.0001	0.0001

Notes: Panel (A) shows results for our linear specification, and Panel (B) for our non-linear specification. Column (1) reproduces our baseline estimates from columns (1) and (2) in Table 4. Columns (2) through (4) report results from placebo regressions. The dependent variable in these placebo regressions is the change in the total number of Germans victimized in crimes with refugee suspects in a county between 2013 and 2014, normalized by the county's 2013 German population. All placebo regressions control for state fixed effects, the change in the crime rate of a county and the (approximate) growth rate of its population between years $j-1$ to j, county-level GDP per capita in year j, and the unemployment rate of a county in year j. In column (2), year j is 2013, in columns (3) and (4), it is 2014. Column (4) excludes $\Delta Crime_{cs2014}$ from the list of covariates. *, **, *** denote statistical significance at the 10%, 5% and 1% level.

of residence during the 2015 refugee crisis.[29] Our key finding hence proves robust to the use of arguably exogenous variation in intra-state county-level refugee inflows during the 2015 refugee crisis.

Third, we add further controls to the set of covariates in our 2SLS estimation which may be correlated with both refugee inflows and changes in the victimization of Germans. The first control we consider is the 2014 crime clearance rate at county level ($clearancerate_{cs2014}$). Clearance rates may correlate with both refugee inflows and crime as well as victimization rates, both in levels and also in changes.[30] If so, their omission could introduce bias in our 2SLS estimates of the effect that refugee inflows during the crisis had on the rate of victimization of Germans in crimes with refugee suspects. As shown in column (2) of Table 7, however, re-estimating by 2SLS our first-difference model with this expanded set of covariates also fails to produce any evidence that refugee immigration during the crisis increased the risk of Germans to be victimized in greater numbers in crimes with refugee suspects. More-

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[29]We obtain the same result when estimating the non-linear specification by 2SLS using $\log(dist_{cs2014}+1)$ and its square as IVs for $\Delta refugees_{cs2015}$ and its square. Tabulated regression results can be obtained from the authors upon request.

[30]High clearance rates may cause crime to fall ('deterrence effect') and also systematically attract, or deter, refugees, possibly of different types, into a region. Law-abiding and crime-fearing refugees, for example, might have sought regions with lower crime levels and higher crime clearance rates, and refugees inclined to engage in criminal activities might have opted for regions with high crime and low clearance rates.

over, clearance rates fail to exert a statistically significant effect on the victimization rate of Germans.[31] As shown in column (3) of Table 7, the same holds true when we add a control dummy variable for urban counties ($citycounty_{cs2014}$), i.e. 'city-counties' (*Stadtkreise*) (there are 107 such administrative urban counties in our estimation sample). Urban counties tend to be richer, more crime prone, and have less scope to house refugees, overall and in decentralized accommodation. Controlling for city-county status, however, proves immaterial for our key finding. Changes in the rate of victimization of Germans in crimes with refugee suspects continue to show no systematic relation to county-level refugee inflows during the crisis.[32]

TABLE 7: Refugee immigration and changes in the rate of victimization of Germans in crimes with refugee suspects at county level (2SLS regression results for expanded sets of covariates and 2014 to 2016 changes in crime incidence measures)

Second Stage:	$\Delta Gvictimrate_{cs2015}$			$\Delta Gvictimrate_{cs2016}$
	(1)	(2)	(3)	(4)
$\Delta refugees_{cs2015}$	−0.0022	−0.0023	−0.0031	−0.0068
	(0.0028)	(0.0028)	(0.0027)	(0.0047)
$clearancerate_{cs2014}$		−0.00017		
		(0.00014)		
$citycounty_{cs2014}$			0.0001***	
			(0.0000)	
First Stage:				
$\log(dist_{cs2014}+1)$	−0.0033***	−0.0033***	−0.0034***	*see column (1)*
	(0.0005)	(0.0005)	(0.0005)	
F statistic	40.78	40.79	42.19	
observations	402	402	402	402
mean of dep. var. 2014	0.0001	0.0001	0.0001	0.0001

Notes: The dependent variable in the second stage equation in columns (1) - (3) (column (4)) is the change in the total number of Germans victimized in crimes with refugee suspects in a county between 2014 and 2015 (2014 and 2016), normalized by the county's 2014 German population. The IV used for $\Delta refugees_{cs2015}$ in the respective first stages is the logarithm of the 2014 average distance in kilometers (plus one) between county c and all counties within the same state s as county c that in 2014 host a refugee reception center ($\log(dist_{cs2014}+1)$). All regressions control for state fixed effects, the 2013 to 2014 change in the crime rate of a county and the (approximate) growth rate of its population, county-level GDP per capita in 2014, and the 2014 unemployment rate of a county. *, **, *** denote statistical significance at the 10%, 5% and 1% level.

Finally, we consider changes between 2014 and 2016 (instead of 2015) in the rate of victimization of Germans in crimes with refugee suspects. The mass of refugee inflows during the crisis occured in the four months of September to December 2015. Our county-level data on crime incidence (crimes and victims), however, is of annual periodicity, covering the whole of 2015. Refugee arrivals in late 2015, therefore, might have had too little time to

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[31]Pre-crisis clearance rates also prove irrelevant for explaining regional refugee inflows during the crisis in the first stage (not tabulated).

[32]City-county status, while a significant positive predictor in the outcome equation, proves also irrelevant in the first stage (not tabulated).

commit crimes against natives on a scale that is of sufficient magnitude to systematically, and statistically significantly, affect annual rates of victimization of Germans in crimes with refugee suspects in 2015. This potential drawback does not apply when measuring rates of victimization in post-crisis year 2016 instead of the crisis year 2015.[33] 2SLS estimation results for our first-difference model using this alternative outcome measure are shown in column (4) of Table 7 (the first stage is the same as in column (1)). As is evident, Germans do not suffer higher risks of victimization between 2014 and 2016 when refugees flowed in larger numbers into their county of residence during the 2015 refugee crisis. Our main finding hence remains unchanged also when using 2016 data for measuring post-crisis outcomes.

Summarizing the above, our core result proves robust in a battery of sensitivity checks. Placebo regressions that predate pre-crisis county-level victimization rates of Germans in crimes with refugee suspects provide no indication that refugee inflows during the crisis are negatively correlated with pre trends in our dependent variable that could invalidate our zero treatment effect finding. Estimation of our first-difference model by 2SLS instead of OLS also fails to produce any evidence that county-level variation in refugee inflows during the crisis had an effect on rates of victimization of Germans in crimes with refugee suspects. This holds true also when we add further potential confounders to our set of covariates, or use changes in victimization rates between 2014 and 2016 (instead of 2015) as the outcome measure in our 2SLS regressions.

5.2 Effect Heterogeneity

Although we found no impact on the overall likelihood of Germans to be victimized in a crime for which the German Federal Police (*Bundeskriminalamt*) records victim information, there is still a possibility that refugee inflows might have affected systematically victimization rates in certain subgroups of such crimes. In this section, we explore such potential effect heterogeneity of refugee inflows on rates of victimization of Germans in crimes with refugee suspects by studying three subgroups of crime, robbery (economic crimes), bodily injury (violent crimes), and rape and sexual coercion (sex crimes), using our 2SLS model specification

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[33]Note, however, that the EoY distribution of refugees in 2015 did not remain stable throughout 2016. Many temporary branches of refugee reception centers were closed down already from February 2016, when monthly inflows of refugees began to abate greatly (Zeit Online, 2016). Furthermore, moving restrictions for refugee arrivals in 2015 expired for increasing numbers in the first months of 2016. The nature and scale of such (potentially endogenous) refugee reallocations across regions is unknown (and cannot be reconstructed because of a lack of detailed administrative data), but of potential importance. If systematic, they may inflate or decrease estimated treatment effects, depending on the selection processes that drive regional refugee reallocations.

in column (1) of Table 7.[34] Second-stage results for all three restricted outcome measures are shown in Table 8.[35]

We first consider robberies, i.e. the unlawful taking of property from others by means of force or intimidation, and the rate of victimization of Germans in such crimes with refugee suspects. As robberies involves theft, they are a property crime; being accomplished by assault, however, they may also be counted a violent crime.[36] In the whole of Germany, a total of 44,666 robberies were recorded in 2015, a figure slightly short of the one recorded in 2014 (BKA, 2016). Column (1) of Table 8 shows the results of re-estimating our first-difference model for this alternative, and crime-specific, outcome measure. As is evident, the results provide no indication that Germans suffered higher rates of victimization in robberies with refugee suspects when refugees settled in larger numbers in their county of residence during the 2015 refugee crisis.

TABLE 8: Refugee immigration and changes in the rate of victimization of Germans in crimes with refugee suspects at county level between 2014 and 2015 (or 2016) (2SLS regression results for different subgroups of crime)

Second Stage:	$\Delta Gvictimrate_{cs2015}$			$\Delta Gvictimrate_{cs2016}$		
	(1) Robbery	(2) Bodily Injury	(3) Rape/ Sexual Coercion	(4) Robbery	(5) Bodily Injury	(6) Rape/ Sexual Coercion
$\Delta refugees_{cs2014}$	0.0004	−0.0010	0.0001	0.0006	−0.0038	2.60e−05
	(0.0006)	(0.0017)	(0.0002)	(0.0007)	(0.0027)	(0.0002)
$\Delta crimerate_{cs2014}$	−0.0009***	−0.0010	−0.0003**	−0.0008**	−0.0013	−1.04e−05
	(0.0003)	(0.0009)	(0.0001)	(0.0003)	(0.0014)	(0.0001)
$\Delta \ln(pop)_{cs2014}$	0.0005**	0.0015**	0.0001	0.0005**	0.0037***	0.0001
	(0.0002)	(0.0007)	(0.0001)	(0.0003)	(0.0011)	(0.0001)
$\ln(GDP)_{cs2014}$	6.85e−06	4.34e−05***	4.93e−07	6.68e−06	0.0001***	3.67e−06**
	(4.50e−06)	(1.30e−05)	(1.55e−06)	(5.00e−06)	(2.06e−05)	(1.86e−06)
$unemployment_{cs2014}$	2.46e−06***	2.01e−06	3.08e−07	1.99e−06***	1.09e−05***	3.31e−07
	(6.78e−07)	(1.96e−06)	(2.34e−07)	(7.53e−07)	(3.11e−06)	(2.81e−07)
observations	402	402	402	402	402	402
mean of dep. var. 2014	0.00001	0.000065	2.50e−06	0.00001	0.000065	2.50e−06

Notes: The dependent variables in the second stage equations measure changes between 2014 and 2015 (columns (1) - (3)), respectively between 2014 and 2016 (columns (4) - (6)), in the total number of Germans victimized in different crimes with refugee suspects in a county, normalized by the county's 2014 German population. Columns (1) and (4) consider robbery (crime key: 210000), columns (2) and (5) dangerous bodily injury (crime key: 222000) and simple bodily injury (crime key: 224000), and columns (3) and (6) rape and sexual coercion (crime key: 111000). The IV used for $\Delta refugees_{cs2015}$ in the respective first stages is the logarithm of the 2014 average distance in kilometers (plus one) between county c and all counties within the same state s as county c that in 2014 host a refugee reception center ($\log(dist_{cs2014} + 1)$). First-stage results are identical to those in our baseline 2SLS specification in column (1) of Table 7 and therefore not reproduced. All regressions control for state fixed effects, the 2013 to 2014 change in the crime rate of a county and the (approximate) growth rate of its population, county-level GDP per capita in 2014, and the 2014 unemployment rate of a county. *, **, *** denote statistical significance at the 10%, 5% and 1% level.

[34]For all three subgroups of crimes, we again obtain same results when estimating a non-linear specification of our first-difference model by 2SLS.

[35]First-stage results are identical to those in our baseline 2SLS specification in column (1) of Table 7 and therefore not reproduced in Table 8.

[36]Robberies (crime key: 210000) include, amongst others, handbag robbery, robbery in residences, robbery or extortion resembling robbery of cash points and businesses or of transports of cash and valuables, assault of a motor vehicle driver resembling robbery, and other forms of robbery in streets, lanes or public places (BKA, 2016).

We next consider bodily injuries, which saw a slight increase in Germany from 2014 to 2015 and a total of 528,863 cases recorded in 2015 (BKA, 2016). Bodily injuries (crime key: 220000) are violent crimes and include, but are not limited to, bodily injuries resulting in death, dangerous and serious bodily injuries, mistreatment of persons under offenders' care, and intentional simple bodily injury. We consider in the following a subset of crimes involving bodily injuries, (the sum of) dangerous and serious bodily injuries (crime key: 222000) and intentional simple bodily injuries (crime key: 224000). Results for rates of victimization of Germans in such crimes with refugee suspects are shown in column (2) of Table 8. Again, refugee inflows during the crisis fail to show any impact.

Finally, we consider rape and sexual coercion (crime key: 111000), i.e., sex crimes, and the likelihood of Germans to be victimized in such crimes with refugee suspects. Sex crimes by refugees (both alleged and real), and a perceived increased risk of exposure to such crimes as a result of the mass inflow of predominantly prime-aged male refugees during the crisis, have received great attention in the media and have fueled both public concerns about refugee immigration and populist-right anti-refugee propaganda, in particular (though not only) after the reported mass assaults on New Year's Eve 2015/16 in Cologne and other cities. Aggregate crime and victim data for the whole of Germany show no increases in rape and sexual coercion from 2014 to 2015. For 2014, police crime statistics recorded 7,345 such crimes with 7,424 victims, of which 6,015 were German. In 2015, the respective numbers were 7,022 crimes, 7,095 victims, and 5,738 German victims.[37] Results for rates of victimization of Germans in sex crimes (rape and sexual coercion) with refugee suspects are shown in column (3) of Table 8. Once more, refugee inflows during the crisis fail to show any impact.

Summarizing the above, we find no evidence that Germans in 2015 were victimized in greater numbers in robberies, bodily injuries, or rapes and sexual coercion when refugees flowed in larger numbers into their county of residence during the 2015 refugee crisis. As shown in columns (4) through (6) of Table 8, this also holds true if we consider changes in victimization rates between 2014 and 2016 (instead of 2015). The findings of our effect-heterogeneity analyses hence do not depend on the time we measure (post-) crisis outcomes.

6   Conclusion

The unexpected mass inflow of refugees to Germany in the 2015 refugee crisis raised widespread concern that Germans would suffer from increased levels of crime by refugees. Robust evidence on this question, however, is still lacking. Empirical studies for Germany on the 2015

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[37]These numbers were taken from PCS data provided online by the Federal Criminal Police Office at: https://www.bka.de/DE/AktuelleInformationen/StatistikenLagebilder/PolizeilicheKriminalstatistik/.

refugee crisis are rare and use data ill-suited to measure both refugee inflows during the crisis and the impact such inflows had on crimes against natives. The broader literature on immigration and crime also provides little guidance on this question, given its predominant focus on non-refugee immigration, its mixed findings, and its focus (like that of the afore-mentioned German studies) on but crude crime and victimization rates that are, we strongly believe and also demonstrate in our empirical analyses, ill-suited for analyses of crimes by foreigners against natives.

Using novel and superior data on both regional refugee distributions and regional measures of criminal activity of immigrants (refugees) against natives (Germans), we explored the impact that the 2015 refugee crisis had on the scale and type of crime committed in Germany, in particular (but not exclusively) refugee crimes against Germans. Exploiting for identification in first-difference regressions spatio-temporal variation across counties in refugee inflows and in refugee populations' age, gender, and housing structures prior to and after the mass inflow of refugees to Germany in the latter half of 2015, we found evidence for a hump-shaped effect of (the scale of) refugee immigration on both the overall crime and the overall victimization rate in a county, and that decentralized accommodation of refugees, at given levels of refugee immigration to a county, exerted a negative effect on the crime rate (regional refugee sex ratios showed no effect). We did not find, however, any evidence for a systematic link between the scale of refugee immigration (and neither the type of refugee accommodation or refugee sex ratios) and the risk of Germans to become victims of a crime in which refugees are suspects. This result, which proves robust in various sensitivity checks, holds true not only for total crimes with victim recording in police crime statistics, but also for sub-categories of such crimes, such as robbery (economic crimes), bodily injury (violent crimes), and rape and sexual coercion (sex crimes).

Our results hence do not support the view that Germans were victimized in greater numbers by refugees. This finding is of great policy and public interest, and it has fundamental implications for the broader literature on immigration and crime, which standardly makes use of but crude crime or victimization rates in their analyses, that is crimes and victims per capita, or variants thereof, but never of actual rates of victimization of natives by foreigners. Our findings suggest that the use of such crude measures of crime incidence can lead to significantly biased inference, misinformed public policy, and misled public opinion.

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Appendix

FIG. A-1: Predicted values of changes in crime and victimization rates and marginal effects of changes in asylum seeker populations between 2014 and 2015
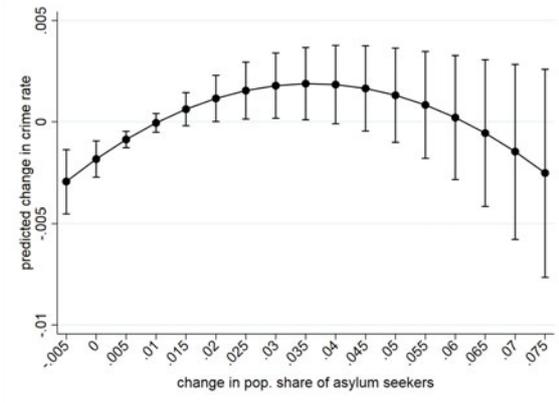
(a) predicted $\Delta crimerate_{1415}$
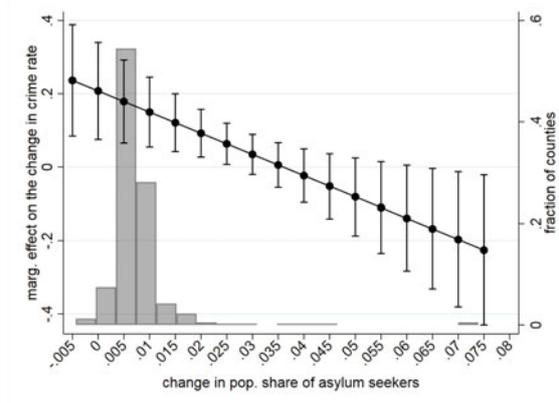
(b) marg. effect of $\Delta refugees_{1415}$ on $\Delta crimerate_{1415}$
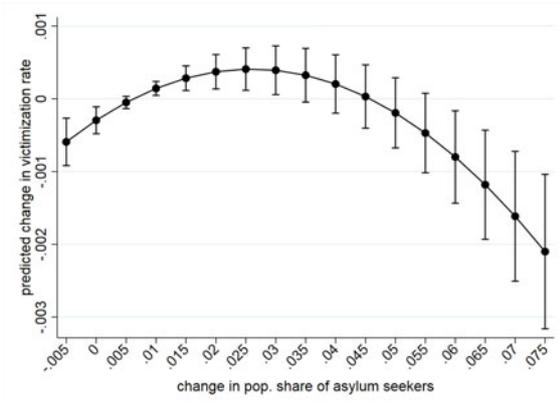
(c) predicted $\Delta victimrate_{1415}$

(d) marg. effect of $\Delta refugees_{1415}$ on $\Delta victimrate_{1415}$