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Do Open Borders Tempt a Saint? Evidence from Schengen on Crime Rates in German Border Regions

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Do Open Borders Tempt a Saint? Evidence from the Schengen Acquise on Crime Rates in German Border Regions

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Abstract

The abolishment of passport and any other type of border controls at the German-Polish and German-Czech border in December 2007 provoked public concerns that open borders would increase cross-border crime. Despite these widespread concerns, empirical research on whether public fears are justified is still scarce. Based on official data on reported crimes from the German Police Crime Statistics, this essay evaluates whether the implementation of the Schengen Acquise in Poland and the Czech Republic in December 2007 increased crime rates in German counties (Landkreise) that share a border with one of these two countries. Conditional difference-in-difference estimation allows the evaluation of the Schengen effects in a causal way. Results show that no significant Schengen effect can be observed for overall crime rates as well as for most types of criminal offenses. Only for burglaries can a significant positive effect be observed. This suggests that for this type of criminal offense, public concerns proved to be justified. In contrast, for overall crime rates as well as for common types of crime against poverty no significant effect can be observed, indicating that there is only little empirical evidence for the widespread concerns about public security.

Keywords: Crime Rates, Border Regions, Schengen Acquise, Open Borders

JEL Classification: R10, K40, F60, J60

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1 Introduction

In December 2007, Poland and the Czech Republic as well as six other Eastern European countries joined the Schengen Zone, resulting in the abolishment of passport and any other type of border controls at the German-Polish and German-Czech border. While the enlargement of the Schengen Zone increased international cooperation and the speed with which goods and people traveled between the member states, the prospect of eliminating border controls also provoked public concerns that open borders would increase crime rates (for example Killias, 1993; Schwell, 2009). In Germany, media coverage suggests that public concerns were particularly strong in regions bordering Poland and the Czech Republic, fueled by the perception that the geographic location directly on the border to Poland and the Czech Republic made these border regions particularly vulnerable to crime (for example Rother, 2007; Weber, 2007). Border regions in the East German Federal States of Brandenburg and Saxony in particular still witness comparatively high voting share for Euroskeptic, populist parties such as the AfD (Alternative for Germany) (Land Brandenburg, 2014) and the presence of vigilante groups in several border communities (for example Bangel, 2014; Bederke, 2014). These phenomena may be nourished by the image of the East as untrustworthy and threatening, which is rooted firmly in the collective memory of the Western public (for example Schwell, 2009; Schwell, 2015).

Based on official data of reported crimes of the German Police Crime Statistics on the county level (Landkreis), this essay examines whether the abolishment of border controls between Germany and Poland and Germany and the Czech Republic in December 2007 affected crime rates in German regions bordering one of these two countries. Effects are identified by conditional difference-in-difference estimations that allows the evaluation of the Schengen effects in a causal way. By applying a quasi-experimental research design that compares the development of crime rates in border regions with the approximated counterfactual situation, i.e. the development of crime rates in these regions had the Schengen Acquise not taken place, the essay exceeds official reports of the German Ministry of the Interior (Bundesministerium des Inneren, 2010a) or the European Commission (European Commission, 2012), which are merely based on descriptive evidence.

The empirical results depict no significant increase in overall crime rates in border regions, following the Schengen Acquise. For burglaries, however, the empirical analyses reveal a statistically significant increase in border regions. This suggests that for burglaries, public concerns proved to be true and public authorities would do well to counteract criminal activities in border regions. At the same time, the empirical findings show that for other, more common

types of criminal offenses, including thievery from motor vehicles, drug-related crimes, or street crime, the abolishment of border controls revealed virtually no effect on crime rates. In light of the current discussion on the future of the Schengen Zone and borderless Europe, this is an important result, because it shows that at least for border regions on the German-Polish and German-Czech border, there is only little empirical support for the widespread concerns about public security.

The remainder of the essay is structured as follows: Section 2 identifies the theoretical mechanisms through which the abolishment of border controls may affect crime rates in border regions and discusses the related literature. Section 3 describes the empirical strategy, while Section 4 reports the empirical results. Finally, Section 5 concludes.

2 Theory and Related Literature

2.1 Regional Crime Rates

The theoretical starting point in this essay is the standard rational choice model of crime participation introduced by Becker (1968) and revised by Ehrlich (1973).[1] According to the model, an individual will engage in crime if the returns from committing a crime outweigh the returns from non-criminal behavior. The returns from committing a crime are calculated relative to the probability of getting caught and the expected sanction if caught. Hence, an individual may commit a crime if:

$$(1-p)U(Crime) - pU(S) > U(Non-Crime),$$

whereby $U(Non-Crime)$ denotes the utility from abstaining from crime, $U(Crime)$ denotes the utility from a successful crime, i.e. a crime in which the perpetrator is not caught, p denotes the probability of being caught, and S the monetary-equivalent sanction if caught (Soares, 2004). Whether an individual will engage in criminal activities then depends on the anticipated costs and benefits of criminal behavior compared to legal behavior. Translated to the regional level, this means that the more prevalent the conditions which make crime attractive in a region, the higher the crime rates within a region are (Soares, 2004).

In the spirit of the Becker-Ehrlich model, the conditions that make crime more or less attractive within a region are frequently attributed to the level of deterrence and the level of legal and

[1] For a detailed discussion on the model at the regional level, see, for example, Soares (2004) or Entorf and Sprengler (2000).

illegal income opportunities within a region (for example Entorf and Spengler, 2000 for the German context). The level of deterrence is commonly indicated by the regional clearance rate and the level of sanctions. Legal and illegal income opportunities can be approximated by several regional characteristics such as the regional income structure, the regional unemployment rate, or the regional GDP.

Deterrence variables such as the clearance rate within a region affect the probability of getting caught, p, and, consequently, the expected utility that potential offenders can yield from crime $U(Crime)$. A higher propensity of getting caught thereby reduces the expected utility from criminal activities. Similarly, higher levels of sanctions, S, such as higher prisoner rates or longer average sentences, decrease the utility that a potential offender can yield from committing a crime. Along with the regional level of deterrence, legal and illegal income opportunities also determine the attractiveness of criminal behavior within a region, as they affect the utility that motivated offenders may gain both from committing a crime $U(Crime)$ and from non-illegal behavior $U(Non - Crime)$. The legal and illegal income opportunities within a region can be approximated by economic variables such as the regional income level or the region's economic performance. The income level within a region can thereby serve as an indicator for both the presence of more or less rewarding jobs and, in turn, higher or lower legal income opportunities within a region. Similarly, it can serve as an indicator for higher or lower levels of transferable assets within regions, making these regions more or less lucrative targets for potential offenders (Entorf and Spengler, 2000). Further variables that are commonly identified in the literature as affecting a regions' susceptibility to crime include the regional unemployment and youth unemployment rate, the regional demographic structure, the share of foreigners and the regional level of educational attainment (Entorf and Sprengler, 2000 for the German context). Regional crime rates can thus be driven by two sets of factors: firstly factors that are associated with the level of deterrence, and secondly factors that are associated with legal and illegal income opportunities within a region. Motivated offenders should then choose committing a crime in region i rather than in region j when the difference between the utility of committing a crime relative to non-criminal behavior is larger in region i than it is in region j.

2.2 Removal of Border Controls and Crime Rates in Border Regions

When border controls are abolished, any change in crime rates in border regions could be attributed to either an increase in crimes committed by domestic offenders or to an increase in crimes committed by offenders from abroad that choose to commit a crime in border regions

on the other side of the border rather than in their domestic region or rather than abstaining from criminal activities.

Regarding the first possibility, the abolishment of border controls between Germany and Poland and Germany and the Czech Republic should not affect domestic offenders, since for them, the probability of getting caught $(1 - p)$ and the level of sanctions S should not change when keeping all other factors constant. Furthermore, regional characteristics that affect legal and illegal income opportunities, such as employment rate or income level, should remain stable in the short-term. Hence, for domestic offenders, the utility of committing a crime $U(Crime)$ and the utility form non-criminal behavior $U(Non - Crime)$ should, ceteris paribus, not be affected by the abolishment of border controls.

In contrast, for motivated offenders from the East, the abolishment of border controls between Germany and Poland and Germany and the Czech Republic may increase the utility of committing a crime in German border regions relative to the utility of committing a crime in domestic regions or the utility from non-criminal behavior. Hence, the removal of border controls may decrease the probability of getting caught p when committing a crime in German border regions. The relatively lower probability of getting caught is reinforced by the fact that cross-border law enforcement is still not fully implemented between Germany and Poland and Germany and the Czech Republic (Schwell, 2015). Motivated offenders from the East can thus expand their operation radius to Germany without facing a higher probability of getting caught. The geographic location of German border regions possibly makes these regions more attractive targets than other German regions, given the potentially lower transaction costs for offenders from the East. These may result from lower transportation costs and a higher familiarity of offenders with these geographically close border regions compared to more distant German regions (for a similar argument for the Swedish-Danish border, see Ceccato and Haining, 2004). The susceptibility of German border regions at the German-Polish and German-Czech border is further reinforced by the fact that – except for the northernmost part of the German-Polish border where the River Oder separates Germany from Poland – the border between both Germany and Poland and Germany and the Czech Republic is a land border. This type of border adjacency is commonly assumed to facilitate the movement of motivated offenders (see Ceccato and Haining, 2004).

When offenders from the East are no longer penalized by a higher probability of getting caught when committing a crime in German border regions, these regions may constitute more lucrative targets compared to Polish or Czech regions. This results from the large wealth differential between Germany and its Eastern neighbors. Hence, the gross national income per capita, measured in purchasing power parties, of Poland and the Czech Republic amounted to merely

40% of that of Germany in 2006, i.e. a year before Poland and the Czech Republic implemented the Schengen Agreement (Baas and Brücker, 2010). German regions might thus be better endowed with transferable assets. At the same time, offenders from the East may face lower sanctions S when committing crimes in Germany than in Poland or the Czech Republic, given that the punitivity is higher in Poland and the Czech Republic than it is in Germany (Dünkel and Geng, 2013)[2]. This may further increase the utility for committing crimes in German border regions relative to committing a crime in domestic regions or relative to the utility for abstaining from criminal activities.

However, descriptive evidence presented in governmental reports (for example Bundesministerium des Inneren, 2010; European Commission, 2012) shows that criminal offenses in border regions did not increase after Poland and the Czech Republic joined the Schengen Zone. One reason for the non effect could be that in anticipation of an increase in motivated offenders, Federal States along the border could have increased their police force to counteract criminal activities. This would increase the level of deterrence and affect the probability of getting caught $(1-p)$ for both domestic and foreign offenders. Indeed, following the implementation of the Schengen Agreement in Poland and the Czech Republic, mobile identity checks in border regions on both sides of the border were expanded to compensate for direct border controls (Rother, 2007; Weber, 2007). On the German side, the extra effort is depicted in an increase of expenditures to the Federal Border Police as well as an increase in expenditures to police in the Federal States bordering Poland and the Czech Republic (see Figure 1). As it becomes evident, expenditures increased relatively more in Federal States bordering Poland or the Czech Republic (3.6% between 2004 and 2008) than non-border Federal States (0.7% between 2004 and 2008). At the Federal level, expenditures increased by 8.4% in the same period of time. Hence, in all four states, police expenditures increased between 2006 and 2008, with Saxony revealing the largest increase. In Saxony, expenditures increased by 4.7% between 2004 and 2008. In the same period, expenditures increased by 3.4% in Bavaria, by 3.0% in Mecklenburg-Western Pomerania and by 2.7% in Brandenburg. When looking at the clearance rates in border regions, Figure 2 shows that clearance rates increased in all four Federal States that share a border with Poland or the Czech Republic between 2006 and 2008, suggesting that after the abolishment of border controls, the level of deterrence actually increased. This would suggest that the positive effect on the probability of getting caught, p, was actually canceled out by an increase in police

[2]Hence, the rate of prisoners, which is commonly used as an indicator for the punitivity within a country, is higher in Poland and the Czech Republic than it is in Germany. In 2012, for example, Poland had 220 prisoners per 100,000 inhabitants and the Czech Republic 219 prisoners per 100,000 inhabitants, whereas the rate of prisoners in Germany amounted to merely 83 prisoners per 100,000 inhabitants in the same year (Dünkel and Geng, 2013).

presence in border regions.

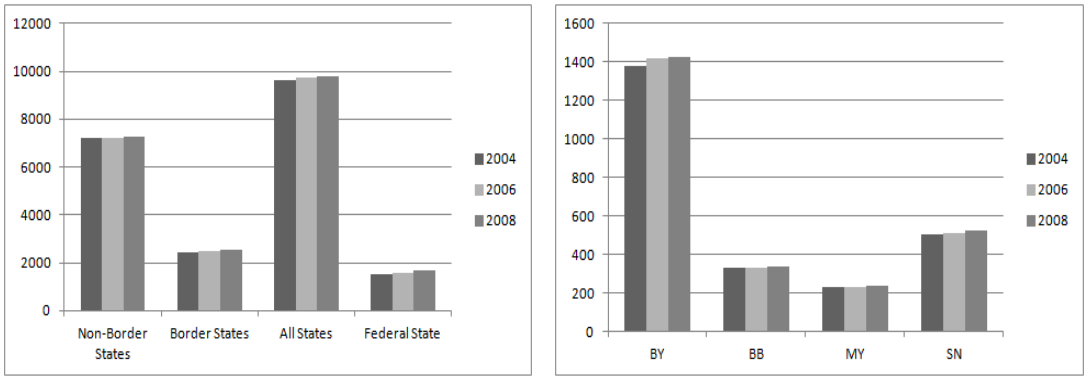

Figure 1: Expenditures to the Police 2004, 2006 and 2008
The left graphic depicts the expenditures to the police in Border States and Non-Border States as well as expenditures of the Federal States. The right graphic depicts expenditures by Border State; BY=Bavaria; BB=Brandenburg; MV=Mecklenburg-Western Pomerania; SN=Saxony. Data are obtained from the Statistical Yearbooks of the German Federal Statistical Office 2007, 2009 and 2011 (Statistisches Bundesamt, 2007, 2009 and 2011).

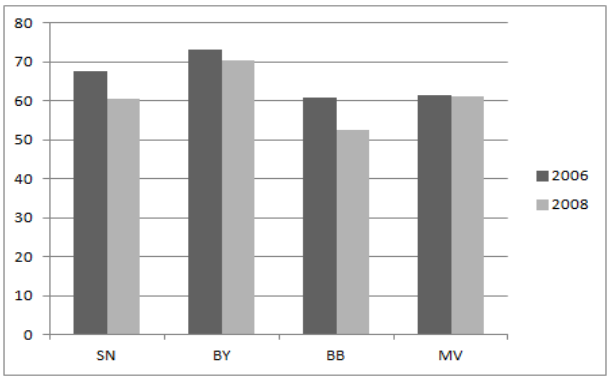

Figure 2: Clearance Rate in Border Regions by Federal State 2006 and 2008
Clearance Rate (in %); BB=Brandenburg; BY=Bavaria; SN=Saxony; MV=Mecklenburg Western-Pommerania. Data are obtained from the German Police Statistics 2006 and 2008

2.3 Related Empirical Studies

Even though the abolishment of border controls and its effect on public security is emotionally and controversially discussed in the public debate, empirical evidence on the effect of open borders on crime is scarce. One reason for the lack of empirical research is that in the last decade following 9/11, border controls worldwide were expanded, rather than relaxed. Hence, the Schengen Zone constitutes an exceptional case in which physical barriers were actually

removed. Yet most studies that examine the consequences of the Schengen enlargement focus on the economic effects of open borders. Davis and Gift (2014), for instance, find that the Schengen membership yields positive effects on trade, while Bartz and Fuchs-Schündeln (2012) show that the abolishment of border controls does not affect cross-border labor mobility in a statistically significant way. In contrast, the effects of the Schengen Aquise on crime are only rarely assessed.

The majority of studies that focus on the effects of open border on crime investigate the effects of increased migration. The main conclusion of these studies is that higher levels of immigrants in a given region significantly correlate with higher crime rates in crimes against poverty, i.e. burglary or thievery, but not with higher crime rates in crimes against the person, i.e. assaults or other forms of violent crimes (e.g. Bell *et al.*, 2013 for Great Britain; Binachi *et al.*, 2012 for Italy; and Alonso-Borrego *et al.*, 2012 for Spain). However, migration is only one possible phenomenon of open borders and cannot be attributed to the abolishment of border control alone. Moreover, the Federal States of Brandenburg, Saxony and Bavaria have not witnessed a significant increase in migration following the Schengen Acquise (Bundesministerium des Inneren, 2010b). A further related stand of literature evaluates the effects of large infrastructure projects that facilitate cross-border movements of people and goods. Here, the study by Ceccato and Haining (2004) examines how the establishment of the Oresund Bridge affected crime rates in Swedish and Danish border regions. Their findings show that the bridge between Sweden and Denmark did not lead to higher crime rates in border regions in general. Only for vehicle-related crimes did the authors find a significant increase. Their findings correspond to a previous report released by the Swedish State Police that examined changes in local crime patterns after the establishment of the Eurotunnel connecting England and France (Ceccato and Haining, 2004). However, both studies focus on the effects of decreased cross-border transaction costs, but not on the genuine effect of abolishment of border control. In contrast, this essay aims at identifying the impact of the removal of border controls themselves. The following sections set up the empirical strategy for identifying the Schengen effect, present the empirical results and discuss these results in the light of the current discussion on the future of the Schengen Zone.

3 Empirical Strategy

3.1 Crime Rates in German Border and Non-Border Regions

The empirical analysis aims at identifying the causal effect of the abolishment of border controls between Germany and its Eastern neighbors on crime rates in the German border regions. The removal of border controls came into force on 21 December 2007, when Poland and the Czech Republic as well as six other Eastern European states implemented the Schengen Acquise. The empirical analysis is based on annual panel data of German counties (Landkreise) for the years 2004 to 2008. The lower bond 2004 is given by the accessibility of official crime data at the county level (NUTS-3 level). The last year of the observation period, 2008, is also determined by the availability of data. Because regional borders in Saxony changed in the course of local governmental reorganization, it is not possible to compare crime data for years before 2009 and after 2009 in Saxon regions. Figure 3 maps the 31 German counties (Landkreise) that share a border with Poland or the Czech Republic. These regions constitute the treatment group in the subsequent analysis.[3]

Data on regional crime rates, i.e. the annual number of reported crimes per 1,000 inhabitants, are compiled from the official German Police Crime Statistics (Polizeiliche Kriminalitätsstatistik) for the Federal Republic of Germany provided by the Federal Criminal Police Office (Bundeskriminalamt). The Police Crime Statistics are so-called outgoing statistics. This means that the statistics contain only those offenses which have come to the attention of the police and have been passed to the public prosecutor's office before compilation began (see Bundeskriminalamt, 2016 for detailed information on the data). The Police Crime Statistics thus do not contain undetected criminal offenses. Therefore, the data do not reveal the real number of crimes within a region, but only the number of recorded cases, which may differ across regions and across types of criminal offenses. Yet a recent study conducted at the German Institute of Economic Research (DIW) shows that in Germany regional crime patterns are – with some exceptions – comparable when including dark figures, i.e. underreported crimes (Bug *et al.,* 2015). Along with the overall regional crime rate, the regional crime rates for selected crimes against poverty are also examined. This accounts for the fact that crimes against poverty such as burglary, thievery, drug-related crimes, criminal mischief and street crime are mostly economically driven and should thus be particularly affected by the abolishment of border controls[4].

[3]The empirical analysis is based on the NUTS-3 classification for 2007, i.e. the year the Schengen Acquise was implemented in Poland and the Czech Republic. In Saxony-Anhalt, regional borders also changed during the observation period. However, in Saxony-Anhalt, crime rates for 2008 could be recalculated in accordance with the distribution of inhabitants for the years prior to the reform.

[4]The five types of criminal offenses against poverty include all types for which data on the NUTS-3 level is

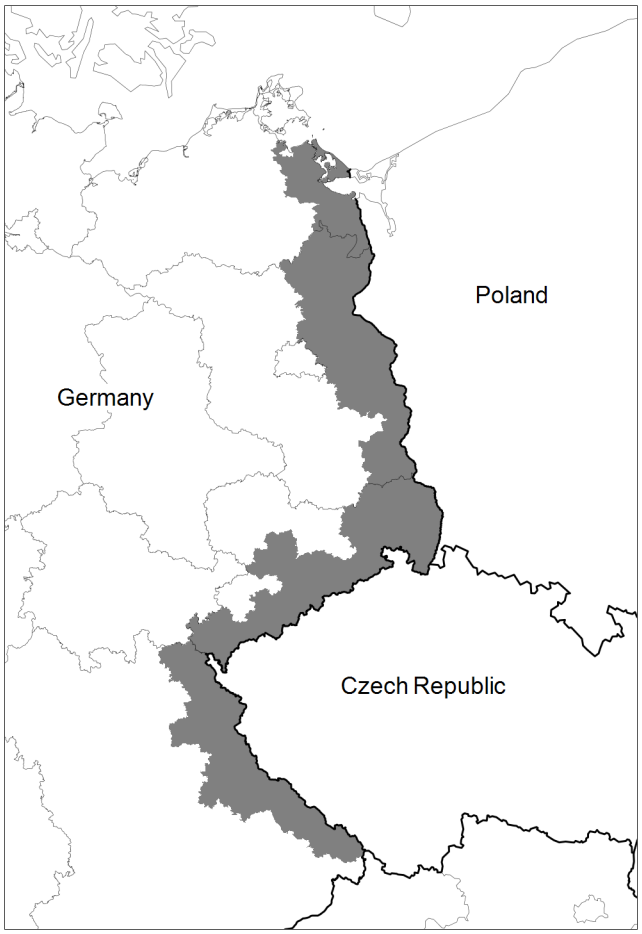

Figure 3: Map of German Border Regions
German counties (Landkreise) located at the border to Poland and the Czech Republic in grey coloring.

Figure 4 depicts crime rates of the counties (Landkreise) located on the border to Poland and the Czech Republic for the years 2006 and 2008, i.e. one year prior to and one year after the abolishment of border controls at the German-Polish and German-Czech border. As the graphics reveal, the overall number of criminal offenses in these regions amounted to 61 crimes per 1,000 inhabitants in 2006, and dropped slightly to 58 crimes per 1,000 inhabitants in 2008. Approximately one third of all crimes were crimes against poverty. When only considering these types of crimes, the rate increased from 22 crimes per 1,000 inhabitants in 2006 to 24 crimes per 1,000 inhabitants in 2008 in border regions. As Figure 4 reveals, this increase is mainly driven by a rise in street crimes and criminal mischief, which are the most common types of crimes against poverty. The rate of burglary also marginally increased between 2006 and 2008, while the rate of both drug-related crimes and thievery from motor vehicles decreased in the

available in the German Criminal Police Statistics.

border regions between 2006 and 2008.

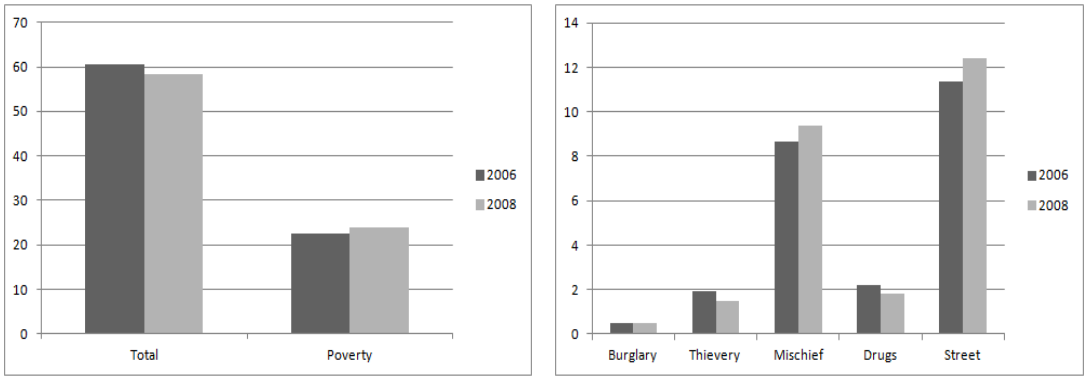

Figure 4: Crime Rates in Border Regions 2006 and 2008
Crimes per 1,000 inhabitants in border regions. Data are obtained from the Geman Police Statistics 2006 and 2008.

The descriptive evidence in Figures 4 shows that overall, there is no noticeable increase in criminal offenses in border regions between 2006 and 2008, i.e. the years prior to and following the Schengen Acquise in Poland and the Czech Republic. Yet the description only reveals the naive effect, i.e. the difference between crimes in border regions before and after the abolishment of border controls[5]. This effect, however, does not say anything about how the rate of criminal offenses in border regions would have developed had Poland and the Czech Republic not joined the Schengen Zone.

To identify the causal effect of Schengen enlargement on border regions one would have to compare the crime rates in border regions in the period after the abolishment of border controls, i.e. $E(y_t|D = 1)$ with crime rates in border regions in the same period had the Schengen enlargement not taken place, i.e. $E(y_t|D = 0)$. However, the situation $E(y_t|D = 0)$, i.e. crime rates in border regions in the period after the abolishment of border controls had Poland and the Czech Republic not joined the Schengen Zone, is unobservable. This is what Holland (1986) calls the fundamental problem of causal inference. One strategy to overcome the problem of causal inference is to approximate the counterfactual situation by identifying a suitable control group of non-treated units, i.e. non-border regions, that are sufficiently similar to the treated ones, i.e. border regions. One possible control group are all German regions that are not located on a border to Poland and the Czech Republic. Since the selection of border regions in the treatment group is exogenously given by the geographic location of a region and is stable over time, this may be a reasonable approach.

[5]The naive estimator is commonly given as $\delta = E(y_t|D = 1) - E(y_{t-1}|D = 0)$, whereby y_t is here the outcome (crime rate) in border regions in the post-Schengen period t in the presence of the Schengen Acquise, D=1, and y_{t-1} is the outcome (crime rate) in border regions in the pre-Schengen period in the absence of the Schengen Acquise, D=0 (for example Shadish *et al.*, 2002).

However, this simple comparison between crime rates of border and non-border regions before and after the implementation of the Schengen Acquise in Poland and the Czech Republic may not be suitable, as border regions may systematically differ from non-border regions in a number of regional characteristics that may be related to regional crime rates. The population density in these predominantly rural regions, for instance, may be below the German average. At the same time, border regions may witness comparatively high unemployment rates, given that the majority of border regions are located in the East German Federal States with unemployment rates above the German average. These discrepancies may violate the conditional independence assumption, stating that – when controlling for certain region-specific covariates $\mathbf{X}$ – crime rates in the pre-Schengen and post-Schengen period are independent from the border location, $E(y) \perp B|\mathbf{X}$. This implies that $E(y_{t-1}|B = 1, \mathbf{X}) = E(y_{t-1}|B = 0, \mathbf{X})$ and $E(y_t|B = 1, \mathbf{X}) = E(y_t|B = 0, \mathbf{X})$, i.e. that the factors that may influence crime rates develop similarly in border and non-border regions. When the conditional independence assumption is violated, these factors – and consequently crime rates – in border and non-border regions would develop differently, even if Poland and the Czech Republic had not implemented the Schengen Acquise. Hence, it may not be a good idea to use the mean of all non-border regions as the control to approximate the counterfactual situation.

Table 1: Descriptive Statistics German Border Regions and Non-Border Regions*

	Border Regions	Non-Border Regions	t	$p > \|t\|$
Share < 6 Years of Age	4.59	5.28	10.97	0.000***
Share 6 < 18 Years of Age	11.21	12.67	8.12	0.000***
Share 18 < 25 Years of Age	8.82	8.28	-5.44	0.000***
Share 25 < 30 Years of Age	5.35	5.61	3.00	0.000***
Share 30 < 50 Years of Age	29.46	30.42	7.24	0.000***
Share 50 < 65 Years of Age	19.70	18.50	-9.47	0.000***
Share 65 < 75 Years of Age	12.22	11.02	-10.1733	0.000***
Share > 75 Years of Age	8.65	8.22	-3.99	0.001**
Population Density	233.15	237.01	4.976	0.000***
Share of Foreigners	3.05	7.34	10.17	0.000***
Umemployment Rate	16.37	10.70	-12.36	0.000***
Youth Unemployment	12.50	12.80	1.50	0.134
Income per capita	14,932.57	17,264.21	11.32	0.000***
GDP per capita	20,083.95	25,658.90	5.9816	0.000***
Share Unskilled Labor	13.27	16.17	7.49	0.000***
Share University Degree	8.12	8.35	0.66	0.509
Clearance Rate	66.14	58.27	-11.03	0.000***

* Column (1) reports means for the years before the Schengen Acquise (2004-2006) in border regions (N=124); column (2) means for the years before the Schengen Acquise (2004-2006) in non-border regions (N=1,592). Column (3) reports the t-values of the test on the H_0 that the mean values of each variable is the same in the treatment and control group. Column (4) shows that the H_0 can be rejected for almost all covariates. Stars denote significance as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Indeed, Table 1 depicts that German NUTS-3 regions located on the border to Poland and the Czech Republic differ substantially from the average German non-border region in several factors that potentially influence regional crime rates such as the regional demography, the regional economic performance, the regional education level and regional clearance rates. Hence, the t-test for the mean comparisons suggests that border and non-border regions substantially differ in almost all region-specific characteristics under consideration. The statistically significant mean differences in the majority of regional characteristics may violate the conditional independence assumption and may lead to a deviate development of crime rates in border and non-border regions in the pre-Schengen period. Indeed, Figure 5 shows that while border and non-border regions share a common trend in overall crime rates, the development of crime rates in crimes against poverty, i.e. burglary, thievery from motor vehicles, criminal mischief, street crime and drug-related crimes, differs between border and non-border regions in the years prior to the Schengen Acquise. Since the common trend assumption may be violated, a simple comparison between border and non-border regions may not be suitable; instead it appears crucial to identify a more credible control group.

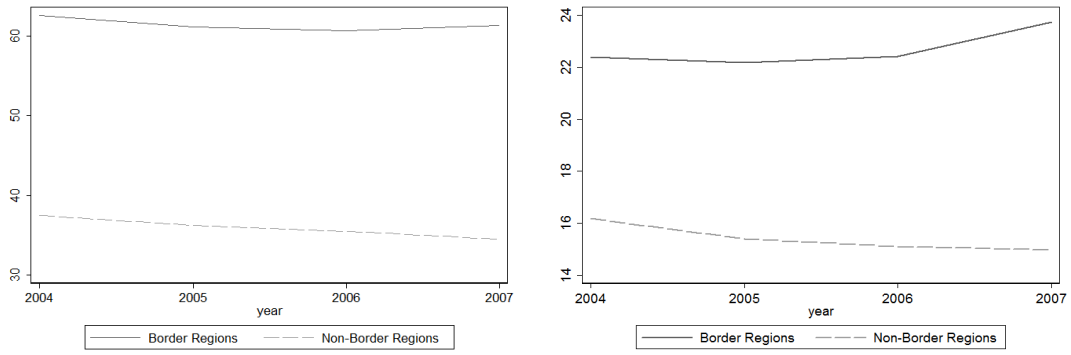

Figure 5: Crime Rates in German Border and Non-Border Regions 2004-2007
The left graph depicts the development of crime rates in overall crimes in the pre-Schengen period; the right graph depicts the development of crime rates in crimes against poverty in the pre-Schengen period. Data are obtained from the German Police Statistics 2004 to 2007.

3.2 Matching Treatment and Control Regions

To identify a control group that better approximates the counterfactual situation, i.e. the development of crime rates in border regions in the absence of the abolishment of border controls, statistical matching is used. Statistical matching aims at controlling preexisting differences between the treatment and control group, so that units in the treatment group are similar or only randomly different from the units in the matched control group on all observed covariates $\mathbf{X}$ that

may affect the outcome variable (Stuart and Rubin, 2008). In doing so, it satisfies the conditional independence assumption that requires that the border location B is not related to crime rates prior to the abolishment of border controls, when controlling for region-specific factors $\mathbf{X}$. Hence, any difference in $\mathbf{X}$ that is due to the border location B is ruled out. Consequently, crime rates are then independent from the border location given, i.e. $E(y) \perp B|\mathbf{X}$.

As the matching procedure, one-to-one nearest-neighbor propensity score matching without replacement is applied. Hence, each border region is matched to the non-border region, without replacement, that has a similar probability, i.e. propensity, of receiving the treatment, given the set of observed covariates $\mathbf{X}$ (see Rosenbaum and Rubin, 1983 or Stuart and Rubin, 2008 for details). Propensity score matching is chosen as the number of covariates that can impact regional crime rates are quite high and propensity score matching decreases the dimensionality of the set of potential covariates $\mathbf{X}$ on which border and non-border regions are matched (see Rosenbaum and Rubin, 1983). To satisfy the common support assumption, requiring that $0 < Prob(B = 1|\mathbf{X} = 1) < 1$ over the distribution of $\mathbf{X}$, only border regions and their matched controls that are on common support are included in the empirical analysis (Stuart and Rubin, 2008)[6].

The set of covariates $\mathbf{X}$ that are used to estimate the propensity scores of the regions contains several regional characteristics that are assumed to affect criminal activities within a region (see Section 3.2). Precisely, the set includes the regional demographic composition, the regional economic performance, the regional level of educational attainment and the regional clearance rate. Data for the covariates are obtained from Eurostat (2016), the Cambridge Econometric Regional Database (2015), the INKAR data of the German Federal Institute for Research on Building, Urban Affairs and Spatial Development (2016) and the German Police Crime Statistics released by the Federal Criminal Police Office (Bundeskriminalamt, 2004 to 2008). The propensity score is calculated by a logistic regression model that regresses the binary border variable on a set of regional control variables in 2006, i.e. the year prior to the implementation of the Schengen Agreement in Poland and the Czech Republic. The estimated coefficients for the likelihood of being a border region, i.e. treatment region, that is $P(B|X)$, are displayed in Table A.1 in Appendix Part I.

The final sample consists of 27 region pairs. Table A.2 in Appendix Part I lists the 27 border regions and their matched control regions. The list shows that most matched control regions are regions within the same Federal State. Out of the matched control regions, only three regions

[6]Four border regions, namely Freyung-Grafenau and Wunsiedel in Bavaria and Görlitz and Niederschlesischer Oberlausitzkreis in Saxony are not on common support and are therefore excluded from the analysis. This changes the average means of border regions between Table 1 and Table 2.

(namely Demmin, Zwickauer Land and Hoyerswerda) are direct neighbors of border regions. Direct spatial spillover effects, should hence not greatly affect the results.

Table 2 shows that the matching procedure generates a balanced sample of treated regions, i.e. border regions, and control regions, i.e. non-border regions, in terms of observed characteristics. Hence, the t-tests of the difference in variable means between treatment and control group show insignificant results in all cases, indicating that the matching procedure indeed eliminates observable differences between treatment and control groups in key regional characteristics. The balance between treatment and control groups on the observed covariates suggests that the two groups will only randomly differ on all observable and unobservable background covariates (see Stuart and Rubin, 2008).

Table 2: Descriptive Statistics Border Regions and Matched Control Regions*

	Border Regions	Matched Control Regionst	$p > \|t\|$	
Share < 6 Years of Age	4.58	4.54	-0.403	0.687
Share 6 < 18 Years of Age	11.15	10.86	-1.1270	0.261
Share 18 < 25 Years of Age	8.88	9.17	2.11	0.036**
Share 25 < 30 Years of Age	5.40	5.59	1.716	0.088*
Share 30 < 50 Years of Age	29.53	29.76	1.12	0.266
Share 50 < 65 Years of Age	19.74	19.72	-0.08	0.935
Share 65 < 75 Years of Age	12.18	12.04	-0.73	0.467
Share > 75 Years of Age	8.56	8.32	-1.451	0.148
Population Density	224.83	227.31	0.36	0.716
Share of Foreigners	3.01	2.99	-0.077	0.937
Umemployment Rate	16.34	16.41	0.097	0.923
Youth Unemployment	12.51	12.77	0.836	0.404
Income per capita	14,936.23	14,736.75	-1.087	0.278
GDP per capita	20,219.78	20,641.52	0.42	0.676
Share Unskilled Labor	12.70	12.21	-0.80	0.427
Share University Degree	8.26	9.62	2.37	0.019**
Clearance Rate	64.75	62.98	-2.14	0.033**

* Column (1) reports means for the years before the Schengen Acquise (2004-2006) in border regions (N=108); column (2) means for the years before the Schengen Acquise (2004-2006) in non-border regions (N=108). Column (3) reports the t-values of the test on H_0that the mean values of each variable is the same in the treatment and control group. Column (4) shows that the H_0 cannot be rejected for almost all covariates. Stars denote significance as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Moreover, Figure 6 shows that crime rates in border regions and their matched controls follow a common trend in the pre-treatment period, which satisfies the common trend assumption. A more thorough test of the common trend assumption is not possible here, as crime data at the county level (NUTS-3 level) are not publicly available before 2004. Hence, it is neither possible to conduct long pre-treatment trend comparisons nor to conduct any pseudo-treatment test. As the graphs in Figure 6 depict, however, aggregated crime rates in border regions for the period from 2004 to 2007 and their matched controls are sufficiently similar. Controlling for several regional characteristics that potentially affect regional crime rates should further alleviate concerns regarding the validity of the common trend assumption (for similar empirical

strategies, see, for example, Braakmann and Vogel, 2010 or Gathmann *et al.*, 2014).

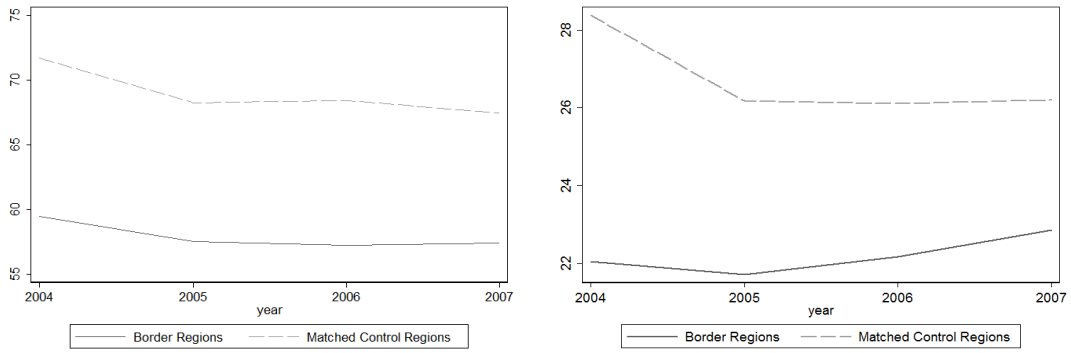

Figure 6: Crime Rates in German Border Regions and Matched Control Regions 2004 -2007 The left graph depicts crime rates in overall crimes in the pre-Schengen period; the right graph depicts crime rates in crimes against poverty in the pre-Schengen period. Data are obtained from the German Police Statistics 2004 to 2007.

3.3 Estimating the Schengen Effect

Having identified a suitable control group, the Schengen effect on crime rates in border regions, i.e. the average treatment effect on the treated (ATT), can be defined as the difference of the difference in crime rates prior to and after the Schengen Acquise between border and non-border regions, i.e.

$$\delta = [E(y_t - y_{1t-1}|B = 1) - E(y_t - y_{t-1}|B = 0)],$$

whereby $E(y_t - y_{1t-1}|B = 1)$ is the difference in crime rates prior to and after the Schengen Acquise in border regions and $E(y_t - y_{1t-1}|B = 0)$ the difference in non-border regions. This equation is also referred to as the conditional difference-in-difference (DiD) estimator (see Blundell and Costa-Dias, 2000 or Smith and Todd, 2005 for a detailed discussion). The corresponding linear difference-in-difference regression model estimated based on annual panel data for border regions and their matched control regions for the years 2004 to 2008 can be formalized as:

$$y_{it} = \alpha_i + \beta_1 B_i + \beta_2 T_{it} + \beta_3 (B_i T_{it}) + \beta_4 \mathbf{X}_{it} + \epsilon_{it},$$

where y_{it} is the outcome of interest, i.e. the rate of criminal offenses of a certain type in region i at time t, α_i is the region-specific constant, B_i is a binary variable that takes the value 1 for border regions and 0 for non-border, β_1 captures the difference between border and non-border

regions in the absence of the Schengen effect, T_{it} contains a time dummy for 2008, i.e. the year after the implementation of the Schengen Agreement in Poland and the Czech Republic, β_2 captures the corresponding coefficient, $\mathbf{X}_{it}$ is a matrix of control variables including the regional level of deterrence, the regional income opportunities and time dummies for the years 2005, 2006 and 2007, β_4 is a vector of the corresponding regression coefficients, and ϵ_{it} is a standard error term. Finally, $B_i T_{it}$ is the interaction term of B_i and T_{it} that takes the value 1 for border regions in 2008. The coefficient β_3 then measures the divergence in average outcomes between the border regions, i.e. treatment group, and non-border regions, i.e. control group, in 2008, which indicates the average treatment effect of the treated (ATT). This is the effect of interest, i.e. the Schengen effect.

The matching procedure outlined above contributes to the conditional independence assumption holding, as it ensures that the difference before and after the treatment in the absence of the treatment are similar conditioned on the propensity of being a border region, P($\mathbf{X}$), that is expressed by the propensity score. Along with the conditional independence assumption, a second key initial assumption is the Stable Unit Treatment Value Assumption (SUTVA), requiring that potential outcomes of units are unaffected by the exposure to the treatment of other units (Rubin, 1980; Stuart and Rubin, 2008). This assumption, often referred to as the non-macro effect assumption, is more difficult to justify. Hence, the abolishment of border controls inevitably affected all German regions, not only regions located on the border to the two new Schengen member states. However, given that the focus of the paper is explicitly on the effect of the abolishment of border controls on crime in border regions, the distinction between the treatment, i.e. border regions, and control group, i.e. non-border regions, seems nonetheless reasonable. Yet, the identified effect can only be interpreted as the lower bond of the true effect.

To increase the efficiency of the estimates further, a set of regional covariates that may affect crime rates within regions is included in the regression model. The set of covariates includes the regional level of deterrence, indicated by the regional clearance rate and the regional economic performance, measured by the regional GDP per capita and the regional GDP growth rate. The regional population density is included as a further region-specific variable, indicating the regional demographic structure. As indicated above, these variables are frequently identified in the geography of crime literature as factors affecting the crime rate in a given region. Data on all regional characteristics are again compiled from Eurostat (2016), the Cambridge Regional Econometrics Database (2015), the INKAR data of the German Federal Institute for Research on Building, Urban Affairs and Spatial Development (2016), and the German Police Crime Statistics of the Federal Criminal Police Office (Bundeskriminalamt, 2004 to 2008).

Table 3: Diffference-in-difference estimates on matched sample: *All Crimes*[*]

	All Crimes	All Crimes	All Crimes	All Crimes
DID	-1.396	-2.559	-.047	2.978
	(2.945)	(3.099)	(3.619)	(3.048)
Year=2008	-3.977	-4.681	-2.210	-2.337
	(2.054)	(2.382)	(3.994)	(4.339)
Border=1	-5.986	-5.425	-3.332	-5.082
	(14.98)	(14.54)	(13.49)	(11.77)
Clearance Rate		-.577	-.853	.508
		(.985)	(.841)	(.712)
GDP per capita			.002	-.001
			(.001)	(.001)
GDP Growth Rate			-306.5*	-197.2*
			(123.5)	(85.82)
Pop. Density				.126***
				(.034)
Yearly Dummies	√	√	√	√
Constant	78.81***	114.9	83.26	23.23
	(8.991)	(65.88)	(67.71)	(54.32)
Onservations	270	270	270	270
McFadden R^2	-.018	-.018	.104	.312

[*] Table entries denote estimated coefficients, robust standard errors (in parentheses) and the level of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4 Empirical Results

4.1 All Crimes

Table 3 depicts the estimated regression coefficients and the corresponding robust standard errors of the linear difference-in-difference regression model on matched samples. The first model specification depicts the estimated regression coefficients without the inclusion of any covariate, while the subsequent model specifications include region-specific covariates that are commonly identified as affecting crime rates at the regional level. Here, the second model specification includes the regional clearance rate, while the third and fourth model specifications also include the regional economic performance, measured through the GDP per capita and the GDP growth rate, as well as the regional population density.

The estimated coefficients in Table 3 show that the interaction term, (DID), which constitutes the parameter of interest, is negative and not statistically significant in the first specification. This indicates that the number of crimes per 1,000 inhabitants in German regions on the border to Poland and the Czech Republic did not change in a statistically significant way compared to their non-border counterparts after Poland and the Czech Republic implemented the Schengen Acquise. The result stays the same when controlling for the regional clearance rate and the regional economic performance. When further controlling for the population density, the interaction term becomes positive, but stays statistically insignificant. The binary variables

for the year 2008 and the border location are also not statistically significant in all four model specifications, which means that crime rates in border and non-border regions did not differ during the entire observation period, i.e. 2004 to 2008, and that crime rates in border regions and in their matched control regions did not change significantly between the pre-Schengen, i.e. 2004 to 2007, and the post-Schengen period, i.e. 2008.

Regarding the estimated coefficient of the various covariates, results show that the regional economic growth rate and the regional population density both have a statistically significant effect on crime rates. The positive regression coefficient for population density suggests that more densely populated areas witness higher crime rates. This finding is in line with the geography of crime literature, suggesting that in more populated, i.e. urban regions, crime rates are higher (Sampson *et al.*, 1997; Entorf and Spengler, 2000). When looking at the regional economic performance indicators, results show that the GDP per capita has no significant effect, while the regional economic growth rate has a statistically significant, negative effect. These findings suggest that in the case of German regions bordering Poland and the Czech Republic and their matched non-border control regions, economically more prosperous regions ceteris paribus witnessed lower crime rates. This result fits with the theoretical consideration of Ehrlich (1973), who proposes that economically prosperous regions provide better legal income opportunities. It does, however, contradict the argument that more prosperous regions are endowed with more transferable assets and may hence constitute more lucrative targets for offenders from outside the region (see Entorf and Spengler, 2000 for a detailed discussion). In contrast to the regional economic growth and regional population density, the regional clearance-rate, measuring the regional level of deterrence, does not have a statistically significant effect on crime rates in German border regions and their matched controls.

4.2 Crimes Against Poverty

Table 4 depicts the estimated results with the rate of crimes against poverty as the outcome variable. Crimes against poverty include burglary, thievery from motor vehicles, criminal mischief, drug-related crimes and street crime. The parameter of interest, i.e. the interaction term, is now positive, but still not statistically significant in all four model specifications. This suggests that the Schengen Acquise and the subsequent abolishment of border controls at the German-Polish and the German-Czech border has also not affected the rate of crimes against poverty in German border regions in a statistically significant way. The binary variables for the post-Schengen period and the border location are again not statistically significant. This indicates that crime rates in border regions and their matched control regions did not change before and after the

Schengen Acquise in a statistically significant way, and that crime rates in border regions and their matched control regions did not differ during the entire observation period, i.e. from 2004 to 2008.

Table 4: Diffference-in-difference estimates on matched sample: *Poverty Crimes*[*]

	Povery Crime	Povery Crime	Povery Crime	Povery Crime
DID	.760	.669	1.781	1.951
	(1.364)	(1.801)	(2.051)	(1.547)
Year=2008	-.231	-2.977	-4.154	-.779
	(1.606)	(1.571)	(2.142)	(2.335)
Border=1	-3.389	-5.382	-4.731	-3.747
	(5.733)	(5.425)	(5.238)	(4.544)
Clearance-Rate		-.767**	-.714**	-.303
		(.224)	(.214)	(.167)
GDP per capita			.001	-.001
			(.001)	(.001)
GDP Growth			-102.9	-68.65
			(51.81)	(38.51)
Pop. Density				.045**
				(.014)
Year Dummies	√	√	√	√
Constant	30.62***	62.43***	48.90**	37.65*
	(3.763)	(11.39)	(16.32)	(14.91)
Observations	270	270	270	270
McFadden R^2	-.017	.099	.166	.323

[*] Table entries denote estimated coefficients, robust standard errors (in parentheses) and the level of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Regarding the regional covariates, results show that for crimes against poverty, regional clearance rates have a statistically significant negative effect. This indicates that for these types of crimes, a higher level of deterrence within a region indeed reduces criminal activities. However, when controlling for the population density, the coefficient for the clearance rate is no longer statistically significant. While the level of economic performance within a region has no statistically significant effect on regional crime rates, the regression coefficient for the regional population density is positive and statistically significant, indicating that crime rates are again higher in urban regions compared to rural ones.

Tables 5 and 6 depict the estimated regression coefficients for various types of criminal offenses as the outcome variable. The findings show that the interaction term, indicating the Schengen effect, is not statistically significant for thievery from motor vehicles (Table 5), drug-related crimes (Table 5), criminal mischief (Table 6) and street crimes (Table 6).

Table 5: Difference-in-Difference Estimates on Matched Samples - Various Types of Crimes I*

	Burglary				Thievery from Motor Vehicles				Drug Related Crimes			
DID	.496**	.518*	.544**	.548**	-.214	-.210	-.138	-.132	.237	.223	.264	.273
	(.180)	(.209)	(.203)	(.203)	(.372)	(.365)	(.344)	(.350)	(.270)	(.272)	(.307)	(.301)
Year=2008	-.616*	-.621*	-.669*	-.615*	-.906**	-.909**	-1.083**	-.890**	-.953***	-.976***	-1.259***	-1.167***
	(.185)	(.192)	(.199)	(.195)	(.292)	(.294)	(.320)	(.326)	(.208)	(.212)	(.322)	(.310)
Border=1	-.490*	-.501*	-.499*	-.503**	-.126	-.128	-.060	-.070	-.455	-.359	-.220	-.247
	(.191)	(.205)	(.199)	(.182)	(.758)	(.753)	(.738)	(.697)	(.639)	(.613)	(.552)	(.541)
Clearance-Rate		.001	.001	.001		-.003	-.004	-.001		-.064*	-.080**	-.066*
		(.001)	(.001)	(.001)		(.017)	(.017)	(.015)		(.030)	(.024)	(.030)
GDP per capita			.001	-.001			.001	-.001			.001	.001
			(.001)	(.001)			(.001)	(.001)			(.001)	(.001)
GDP Growth			-.647	.370			-8.504*	-4.967			-9.098*	-7.531*
			(.899)	(.910)			(3.777)	(2.626)			(4.046)	(3.726)
Pop. Density				.001**				.004***				.002
				(.001)				(0.001)				(.002)
Year Dummies	√	√	√	√	√	√	√	√	√	√	√	√
Constant	1.233***	1.151***	.604	.785	3.069***	3.133***	1.553	2.122*	3.410***	9.433**	8.263**	7.252*
	(.176)	(.212)	(.375)	(.406)	(.344)	(.498)	(.952)	(.991)	(.386)	(3.346)	(2.803)	(3.218)
Observations	270	270	270	270	270	270	270	270	270	270	270	270
McFadden R^2	.089	.087	.124	.238	-.004	-.008	.049	.153	-.001	.020	.218	.241

* Table entries denote estimated coefficients, robust standard errors (in parentheses) and the level of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

This indicates that for these types of criminal offenses, the abolishment of border controls at the Polish-German and Czech-German border did not affect crime rates in German border regions in a statistically significant way. The Schengen effect is, however, positive and statistically significant for burglary (Table 5), indicating that the Schengen Acquise and the subsequent abolishment of border controls indeed affected the number of reported burglaries per inhabitant in German regions on the border to Poland and the Czech Republic. In the baseline specification, i.e. the specification without any region-specific covariate, the estimated coefficient has a value of .496, which is difficult to interpret in terms of effect size. When taking the natural logarithm of crime rates as the dependent variable, the estimated coefficient amounts to .527, which indicates that because of the removal of border controls, crime rates in border regions increased by 52.7%, which is a comparatively large Schengen effect (see Table A.3 in Appendix Part I). The positive effect remains similar when controlling for region-specific covariates. This finding indicates that public concerns that the removal of physical barriers at the German-Polish and German-Czech border would increase crimes in border regions are not completely unjustified.

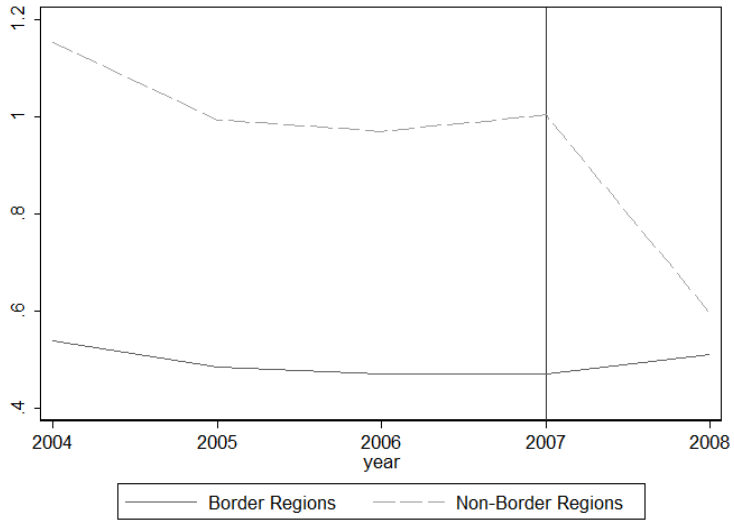

Figure 7: Rate of Burglaries in Border Regions and Matched Non-Border Regions 2004-2008
Rate of burglaries indicates the number of reported burglaries per 1,000 inhabitants.

Yet results also reveal that the positive effect is mainly driven by a sharp decrease in burglaries in the matched control regions. Hence, as Figure 7 illustrates, the rates of burglaries decreased in the matched non-border regions, whereas in border regions, the rate of burglaries stayed more or less the same between 2007 and 2008. The negative and statistically significant coefficient for the border location dummy variable also depicts that border regions actually witnessed

fewer burglaries per 1,000 inhabitants than their non-border matched controls in the entire observation period, i.e. from 2004 to 2008. The negative effect for the 2008, i.e. post-Schengen, dummy reveals that the rate of burglaries decreased after the Schengen Acquise in border regions and their matched controls.

The estimated coefficients of the post-Schengen dummy variables are also negative and statistically significant for drug-related crimes and thievery from motor vehicles, indicating that these types of crime also deceased in 2008 compared to the pre-Schengen period in both border regions and their matched control regions. For the remaining types of criminal offenses, the estimated coefficients are, overall, not statistically significant. Regarding the border location, the estimated coefficients are negative for all five types of criminal offenses under consideration. However, the effects are only statistically significant for burglaries, whereas in the other crime types, the rates did not differ between border regions and their matched controls in a statistically significant way between 2004 and 2008.

Table 6: Difference-in-Difference Estimates on Matched Samples - Various Types of Crimes II*

	Criminal Mischief				Street Crime			
DID	.115	.061	.495	.580	.363	.116	.872	1.050
	(.491)	(.469)	(.602)	(.550)	(.884)	(1.152)	(1.146)	(.915)
Year=2008	1.384**	1.081	.950	1.979*	-.093	-.203*	-.872	.213
	(.499)	(.700)	(.784)	(.809)	(1.011)	(1.124)	(1.506)	(1.574)
Border=1	-.666	-1.082	-.507	-.139	-2.107	-3.053	-2.577	-2.108
	(1.896)	(1.822)	(1.911)	(1.464)	(3.250)	(3.153)	(3.216)	(2.795)
Clearance-Rate		-.100	-.001	.092		-.528*	-.404	-.133
		(.124)	(.104)	(.097)		(.211)	(.219)	(.188)
GDP per capita			.001	-.001			.001	-.001
			(.001)	(.001)			(.001)	(.001)
GDP Growth			-34.50*	-20.24			-61.22	-41.80
			(16.71)	(11.41)			(35.35)	(27.12)
Pop. Density				.019***				.026**
				(.005)				(0.008)
Year Dummies	√	√	√	√	√	√	√	√
Constant	9.961***	13.56**	6.467	5.104	16.40***	30.64***	21.86	17.10
	(1.295)	(4.821)	(6.358)	(6.787)	(2.301)	(6.920)	(11.52)	(11.00)
Observations	270	270	270	270	270	270	270	270
McFadden R^2	-.014	-.009	.043	.326	-.015	.053	.106	.284

* Table entries denote estimated coefficients, robust standard errors (in parentheses) and the level of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Regarding the region-specific covariates, results show that the regional level of deterrence, measured through the regional clearance rate in a particular type of crime, does not yield a statistically significant effect for any of the five types of criminal offenses, except for drug-related crimes. Here, the corresponding regression coefficient is negative and statistically significant, indicating that the higher the regional clearance rate in drug-related crimes, the lower the crime rate in drug-related crimes is. The coefficient is also statistically significant for street crime, but

becomes insignificant when controlling for the regions' economic performance and population density.

With respect to the economic indicators, results show that the regional GDP per capita does not have a statistically significant effect on crime rates in border regions and their matched controls. In contrast, the economic growth rate has a statistically negative effect on the crime rates in drug-related crimes, suggesting that drug-related crimes are less frequent in economically prosperous regions. The effects are also significant for street crime and thievery from motor vehicles, as long as the regional population density is not included in the model. The negative effect supports the view that better legal income opportunities reduce crime; yet it stands in contrast to the assumption that economically prosperous regions should witness more crimes given their relative higher endowment with transferable assets. Regarding the population density, the regression coefficients are positive and statistically significant for all five types of criminal offenses, except for drug-related crimes, indicating that more densely populated regions ceteris paribus witness higher crime rates in these types of criminal offenses. For drug-related crimes, the regression coefficient for population density is negative, suggesting that drug-related offenses are also common in less populated, rural regions. This finding is in line with recent media reports about an increase in drug abuse in rural Saxon and Bavarian regions located near the border to the Czech Republic (Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit, 2016).

Overall, the empirical analysis shows that the abolishment of border controls on the German-Polish and German-Czech border had no effect on overall crime rates as well as on crime rates in the common types of poverty crimes in German border regions. One potential explanation for the insignificant effect may be that the risk perception and anticipated benefits of criminal activities in German border regions have not changed for potential offenders from the East after border controls were abolished. Another explanation may be the reinforcement of police presence in the immediate border regions once border controls were eliminated. In fact, as indicated above from 2006 to 2008, expenditures to the police increased in all four Federal States bordering either Poland or the Czech Republic. For the rate of burglaries, however, a positive and statistically significant effect can be observed. This finding supports public concerns that the abolishment of border controls would increase crime. Public concerns may be reinforced by the fact that burglaries are one of the most feared types of criminal offenses in Germany (Hirtenlehner and Hummelsheim, 2015)[7]. This may explain the public concerns revealed, despite the fact that compared to other types of criminal offenses, the number of burglaries per 1,000

[7]In a survey conducted by the German Police Crime Office in 2014, the fear of burglaries ranked even above the fear of robbery or rape among the German public (Hirtenlehner and Hummelsheim, 2015).

inhabitants in border regions is quite low and increased only slightly between the pre-Schengen and post-Schengen period in these regions.

5 Discussion and Conclusion

This essay has assessed whether the abolishment of border controls at the German-Polish and German-Czech border in December 2007 affected crime rates in German regions located on the border to Poland and the Czech Republic based on annual panel data of German counties (Landkreise) for the years 2004 to 2008. Effects were identified by conditional difference-in-difference estimation on matched samples. This approach allows the identification of the Schengen effect on border regions, in a causal way. Results show that no significant Schengen effect can be observed for overall crime rates as well as for most of the common types of criminal offense. However, for the rate of burglaries, the data reveal a positive and statistically significant effect, indicating that for burglaries, public concerns about an increase in crime following the Schengen Acquise proved to be true. The identification strategy, however, also shows that the effect is primarily driven by a sharp decline of burglaries in the matched control regions instead of a sharp increase of burglaries in border regions. Moreover, results reveal that for other, more common types of criminal offenses, including criminal mischief, street crime, thievery out of motor vehicles or drug-related crimes, the abolishment of border regions had virtually no effect on crime rates in border regions.

Even though the results provide initial empirical evidence of the causal effect of the abolishment of border controls on crime rates in border regions, some empirical caveats have to be noted. Firstly, the stable unit treatment value assumption (SUTVA) may not hold in the context of this essay. Hence, along with the border regions, the remaining German regions were also affected by the elimination of border controls, and spatial spillover effects cannot be ruled out. The findings can hence only be interpreted as lower bonds of the true effect. Secondly, the number of border regions is very low, which reduces the power of the estimation. Moreover, it is possible that results are driven by a few outlier regions with regional peculiarities. To increase the number of observations, it may be worthwhile in future research to conduct sub-regional-level analyses, for example for German municipalities bordering Poland and regions bordering the Czech Republic. However, crime data on this sub-regional level may prove difficult to obtain. Thirdly, the empirical analysis is constrained to the time period from 2004 to 2008 and includes only one year for the post-Schengen period. The results, therefore, only indicate the short-term effect, but do not allow any conclusions about medium-term or long-term effects.

Finally, the paper does not assess potential channels through which the removal of physical barriers affects burglaries in border regions. In future research, it may hence be desirable to consider the type of border adjacency, the physical infrastructure and trade routes between German border regions and their Polish and Czech counterparts. This would allow conclusions about the relevance of these factors that are frequently identified in the literature as spurring border regions' susceptibility to crime (see, for example, Ceccato and Haining, 2004, Johnson; 2014 or Wilson, 2009)[8]. Furthermore, it may be of interest to expand the empirical analysis to non-border regions that are direct or indirect neighbors of border regions. This would allow the tracing of the spatial dimension of the European integration effects at EU internal borders.

Despite these caveats, the paper still offers an initial attempt to empirically identify and evaluate the causal effect that the abolishment of border controls at the German-Polish and German-Czech border had on crime rates in German border regions. Results show that for the most common types of criminal offenses, no significant increase in crime rates can be observed. Hence, in contrast to public concerns, border regions have not per se experienced an increase in crime rates as a result of the implementation of the Schengen Acquise in Poland and the Czech Republic. However, for burglaries, a statistically significant positive effect can be observed, indicating that public concerns are not completely unjustified. Against this background, public authorities would do well to counteract criminal activities in border regions more intensively. This would also signal political awareness, which may decrease public concerns and the drift of voters in border regions to populist or even nationalist parties that exploit public fears. At the same time, the empirical results show that for other types of criminal offenses such as street crime, thievery of motor vehicles, criminal mischief or drug-related crimes, the Schengen Acquise had virtually no effect on crime rates in German border regions. In light of the prevailing xenophobic tendencies especially in East German border regions and the current discussion on the future of the Schengen zone and borderless Europe, this is quite a relevant result, because it shows that that at least for border regions at the German-Polish and German-Czech border, there is only little empirical support for the widespread concerns about public security.

[8] Wilson (2009), for example, identifies an increase in crime in regions that constitute the core of EU economic and logistic corridors, while Johnson (2014) finds an increase in crime in English regions with Channel ports. For a similar argument, see also Ceccato and Haining, (2004).

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A Appendix

Table A.1: Logistic Regression Model*

Border	
Share < 6	-10.91702
	(10.50342)
Share $6 < 18$	-10.27057
	(10.31496)
Share $18 < 25$	-11.00117
	(10.4785)
Share $25 < 30$	-11.04487
	(10.28348)
Share $30 < 50$	-10.77511
	(10.32984)
Share $50 < 65$	-10.26991
	(10.36792)
Share $65 < 75$	-10.67353
	(10.33083)
Share > 75	-10.54836
	(10.35441)
Population Density	-.0013943
	(.0015976)
Share Foreigners	-.2197611
	(.2029736)
Umemployment Rate	.1432773
	(.1147184)
Youth unemployyment	.1434077
	(.159633)
Income per capita	.0000862
	(.0000598)
Share Unskilled Labor	.2108274
	(.1742712)
Share University Degree	.3572792**
	(.1630551)
Clearance Rate	.1840768**
	(.0492367)
Constant	1051.072
	(1034.203)
N	428
Pseudo R^2	0.3853

* Table entries denote regression coefficients of a logistic regression model. Dependent variable: border region. Stars denote significance of the estimates as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.2: Border Regions and Matched Control Regions

Regen	(DE229)	Altenburger Land	(DEg0m)
Weiden i. d. Opf, kreisfreie Stadt	(DE233)	Dingolfing-Landau	(DE22c)
Cham	(DE235)	Dessau-Roßlau, kreisfreie Stadt	(DEe01)
Neustadt a. d. Waldnaab	(DE237)	Suhl, kreisfreie Stadt	(DEg04)
Schwandorf	(DE239)	Ostprignitz-Ruppin	(DE416)
Tirschenreuth	(DE23a)	Rügen	(DE80h)
Hof, kreisfreie Stadt	(DE244)	Eichsfeld	(DEg06)
Hof, Landkreis	(DE249)	Bernkastel-Wittlich	(DEb22)
Frankfurt (Oder), kreisfreie Stadt	(DE411)	Demmin	(DE808)
Barnim	(DE412)	Darmstadt, kreisfreie Stadt	(DE711)
Märkisch-Oderland	(DE413)	Jena, kreisfreie Stadt	(DEg03)
Oder-Spree	(DE415)	Haßberge	(DE267)
Uckermark	(DE418)	Sömmerda	(DEg0d)
Cottbus, kreisfreie Stadt	(DE422)	Rottal-inn	(DE22a)
Spree-Neiße	(DE429)	Güstrow	(DE809)
Ostvorpommern	(DE80f)	Döbeln	(DEd33)
Uecker-randow	(DE80i)	Kyffhäuserkreis	(DEg0a)
Plauen, kreisfreie Stadt	(DEd12)	Bitburg-Prüm	(DEb23)
Annaberg	(DEd14)	Hoyerswerda, kreisfreie Stadt	(DEd23)
Freiberg	(DEd16)	Weimar, kreisfreie Stadt	(DEg05)
Vogtlandkreis	(DEd17)	Leipziger Land	(DEd34)
Mittlerer erzgebirgskreis	(DEd18)	Zwickauer Land	(DEd1c)
Aue-Schwarzenberg	(DEd1b)	Muldentalkreis	(DEd35)
Bautzen	(DEd24)	Torgau-Oschatz	(DEd36)
Löbau-Zittau	(DEd28)	Nordhausen	(DEg07)
Sächsische Schweiz	(DEd29)	Riesa-Großenhain	(DEd27)
Weißeritzkreis	(DEd2a)	Saalfeld-Rudolstadt	(DEg0i)

Table A.3: Diffference-in-difference estimates on matched sample: *Log Burglary*[*]

	Log Burglary	Log Burglary	Log Burglary	Log Burglary
DID	.527**	.517*	.555**	.559**
	(.188)	(.199)	(.197)	(.196)
Year=2008	-.552**	-.549**	-.605**	-.549**
	(.179)	(.179)	(.188)	(.187)
Border=1	-.622**	-.617**	-.615**	-.619**
	(.202)	(.209)	(.201)	(.184)
Clearance Rate		-.001	.002	.003
		(.004)	(.003)	(.003)
GDP per capita			.001	-.001
			(.001)	(.001)
GDP Growth Rate			-1.251	-.207
			(.887)	(.915)
Pop. Density				.001**
				(.001)
Yearly Dummies	√	√	√	√
Constant	-0.091	-.054	-.659	-.473
	(.152)	(.192)	(.358)	(.382)
Onservations	270	270	270	270
McFadden R^2	.118	.115	.158	.266

[*] Table entries denote estimated coefficients, robust standard errors (in parentheses) and the level of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Dependent variable: Log rate of burglary