

## Alternatives to custody

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## ALTERNATIVES TO CUSTODY: EVIDENCE FROM POLICE FORCE AREAS IN ENGLAND AND WALES

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*England and Wales have some of the highest incarceration rates in the developed world. Recent policy reforms have focused on developing alternatives to custody that offer credible protection for the public, and justice for victims of crime. This article uses unique detailed panel-level data acquired from the Ministry of Justice for all Police Force Areas from 2002 to 2013 in England and Wales to analyse the effects of custodial and non-custodial sentences on recorded crime. Our results suggest that non-custodial sentences can be an effective alternative to custody at reducing property crime but their effect is less consistent for violent crime. This suggests that non-custodial sentences are credible, cost-effective substitutes to incarceration.*

**Key Words:** panel data, incarceration, community sentences, sentencing policy, violent crime, property crime

### *Introduction*

World-wide prison populations have increased substantially since the mid-1990s (Walmsley 2012). In England and Wales, the prison population increased from around 17,400 in 1900 to over 85,300 in 2016, and in March 2017 the total prison population was just over 85,500 (Allen and Watson 2017). In 1901, there were 86 prisoners per 100,000 head of population that increased to 182 per 100,000 head of population by 2016. Incarceration is an expensive and socially divisive response to crime. Nevertheless its widespread use is defended not only on grounds that it is a fitting punishment but also in the belief that it reduces crime. However, its effectiveness is contested (Jolliffe and Hedderman 2015). Further, given its costs,<sup>2</sup> even those who find custody a fitting response to crime may need to re-think their views. Indeed, finding effective alternatives to custody is a key motivation for policymakers and researchers. The search for effective alternatives to custody has become even more urgent following the recent recession and the demand for governments to make cuts in public services, including

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<sup>1</sup>The views and opinions expressed in this article are those of the author and do not reflect the official policy or position of Amazon. This work was conducted by the author prior to joining Amazon.

<sup>2</sup>The annual average cost for each prison place is £36,808 (figure for England and Wales, 2012–13, taken from Prison Reform Trust (2014)) while each new prison place is estimated to cost £119,000. By contrast, an intensive community order costs between £10,000 and £15,000. A Home Detention Curfew for 90 days is estimated to cost £1,300 compared to £6,500 for a similar period in custody (Heard 2015).

the criminal justice system (Neilson 2010; Bandyopadhyay 2013). Although community sentences have existed in some form since 1907 (Solomon and Silvestri 2008), in recent decades criminal justice legislation has expanded the range of formal requirements available to courts when imposing them. Conditions now include regular supervision, electronic tagging, curfews, unpaid work and participation in drug rehabilitation programmes. Consequently, courts in England and Wales now have the power to sentence offenders to a range of non-custodial alternatives with varying levels of prospective deterrence, punishment severity, surveillance and associated rehabilitative support. This article offers an empirical analysis of how effective these alternative sentences are at reducing crime compared to custody.

The impact of incarceration on crime reduction is theoretically ambiguous as there are many counter-balancing effects through which prison can affect crime rates (Friehe and Miceli 2017). Theorized forms of crime reduction include incapacitation of individual offenders (to prevent further offences while in prison), specific deterrence (punishing an offender in the hope of discouraging their individual recidivism), and general deterrence (discouraging a wider population of potential offenders from committing crime through the prospect and expectation of punishment) (Becker 1968; Levitt and Kessler 1999). However, there are also mechanisms through which prison is theorized to have criminogenic effects (Engelen *et al.* 2016). Prisons can prevent offenders from acquiring useful skills in legitimate labour markets; label offenders formally as deviant, marking them as unsuitable for reintegration into society; have psychologically destructive effects that prevents prisoners from returning to normal life when released; reduce access to and even destroy familial relationships and other sources of social support and integration; and generate a pro-crime environment where prisoner peer groups, and even prison officers, reinforce deviant identities and behaviours (Gendreau *et al.* 1999; Cid 2009; Cullen *et al.* 2011).

Our contribution is to apply a unique panel of Police Force Area (PFA) level data in England and Wales in order to understand the impact of alternative sentencing policies such as community sentences on crime rates. This data set was requested through a *Freedom of Information* request. It details how many different sentences have been issued for all crime types each year from 2002 to 2013. This data set allows us to distinguish between the number of prison sentences (custody) and non-custodial sentences (community sentences, conditional discharge, fines and suspended sentences) imposed by local courts. We exploit the significant sentencing discretion traditionally granted to local courts (Brownlee and Joanes 1993; Tombs and Jagger 2006, p.806; Pina-Sánchez *et al.* 2017), and plausibly maintained even after the introduction of compulsory sentencing guidelines (Roberts 2011).<sup>3</sup> This allows for a more detailed examination of criminal justice practice on PFA level crime than has yet been achieved in the United Kingdom. We analyse the effect of alternative sentencing methods on crime rates in PFAs by using sentence-type and offence-type conviction rates derived from data on total number of sentences across all PFAs each year. Our data include violence against the person, sex offences, robbery and property crime, allowing us to explore the effects of alternative sentencing on each crime category separately. Our model of using variations in

<sup>3</sup>Pina-Sánchez and Linacre (2013) challenge this appraisal of sentencing discretion in England and Wales. However, they show that sentencing guidelines influence decisions in a consistent way but not that sentencing itself is consistent across courts.

sentencing data across PFAs, rather than prison population, means that we can avoid some of the well-established problems with using prison population data (Spelman 2008). An important caveat is that it is not possible to disaggregate all the mechanisms through which criminal justice might affect crime rates. As Durlauf and Nagin (2010) note of panel data approaches generally, ‘these studies are actually measuring a combination of deterrent and incapacitation effects’.

### *Previous research*

Establishing and explaining a causal connection between sentencing policies, offender behaviour and community experience of crime is a key challenge in the study of criminal justice. An array of randomized controlled trials (RCTs) have examined the effects of short periods of custody on offenders compared to alternative sentences (Killias *et al.* 2000, 2010; Killias and Villetaz 2008). The results are not conclusive but suggest that prison for low-level offenders might have a small criminogenic effect. However, the nature of criminal justice policy implies that randomization can rarely be applied as part of a research design and only in narrow circumstances. Matching studies, therefore, allow for a much wider comparison of offenders. Smith *et al.* (2002) systematically review studies comparing the effects of community sentences with custodial sentences. A small effect suggesting that prison sentences might be associated with increased recidivism was found. Further work tends to confirm this result that suspended or community sentences (including the use of electronic tagging) are associated with lower levels of offending than prison sentences (Nieuwebeerta *et al.* 2009; Cid 2009; Wermink *et al.* 2010; Bell 2011; Andersen and Andersen 2014; Jolliffe and Hedderman 2015; Andersen 2015).

Matching approaches have become successively more useful for estimating the impact of differential sentencing on individual offenders, including long term impacts on criminal career trajectories. However, these studies have limitations. First, they rely on matching similar offenders who are given different sentences. The resulting samples, though much more extensive than the available study population in RCTs, may still not represent perfectly comparable offenders. Second, they may also not be typical of the offender population. It is difficult to extrapolate these individual-level effects to impacts on local communities that a criminal justice system is serving.

Drago *et al.* (2009) (cf. Drago *et al.* 2011; Drago and Galbiati 2012) offer an ingenious effort to deal with some of these challenges. They exploit a mass pardon in the Italian prison system that introduced a number of exogenous changes to a cohort of prisoners. They found that prisoners pardoned early, and so eligible for a longer sentence if reconvicted were significantly less likely to re-offend. They conclude that the prospect of prison deterred subsequent crime. The potential weakness of this analysis is that the prospect of a longer sentence is reverse correlated with the length of the sentence served so far (Durlauf and Nagin 2010). This means that it is impossible to say from this study whether the lower level of observed offending is due to less prison experienced already or the prospect of more prison in the future.

Not all of the theorized effects of sentencing involve only the effect on individual offenders. The use of district-level data, and especially panel data analyses, are important additions to our understanding of how the criminal justice system influences a

community's experience of crime. Whereas studies of re-offending statistics can only capture the effect of criminal justice interventions on subsequent re-offending by individuals, panel data, in principle, can estimate the number of crimes prevented through incapacitation and general deterrence in a population of potential offenders. In the United States, several panel studies have been used to explore the effects of incarceration on crime rates (Durlauf and Nagin 2010). The results have varied, with only some studies suggesting that prison population growth had a small deterrent effect. Vieraitis *et al.* (2007) combined panel data of prison growth and prisoner releases. They found that prison growth was associated with lower crime but that releasing prisoners was associated with higher crime. They attributed this to the criminogenic effects of incarceration. Spelman (2013) attempts to disentangle the co-dependence of crime and prison population, by finding instruments for crime that predict changes in prison population, before deriving the effects of prison on crime. His results suggest that increased use of prison is crime-reductive in the United States.

Outside of the United States, recent panel data studies have associated higher conviction rates, higher detection rates and larger police forces, as well as various social factors including wage inequality, educational attainment, poverty and unemployment, with variations in crime rates (Witt *et al.* 1999; Carmichael and Ward 2001; Machin and Meghir 2004; Spengler 2006; Sabates 2007; Andrews 2011; Saridakis and Spengler 2012; Han *et al.* 2013). However, few non-US analyses have been able to explore variation in sentencing subsequent to conviction. An important exception to this is Bell *et al.* (2014), which exploits variation in sentence severity following the 2011 riots in London to identify a deterrent effect of harsher sentencing. Our approach, therefore, has the unique advantage of observing sentencing variation in hitherto unexamined detail.

### Data

We obtained a unique data set from the Ministry of Justice through a *Freedom of Information* request detailing how many different sentences have been issued for those crime types in each year. In the United Kingdom sentencing is classified into custodial and non-custodial. Custodial sentences include immediate custodial sentences (both determinate and indeterminate length) and suspended sentences. Non-custodial sentences include fines, community service, conditional discharge and absolute discharge. Our data include the total number of sentences issued to adult and juvenile offenders in each PFA every year for each sentence type as listed earlier. We use these data to test whether different sentencing (with a lag) has a different effect on crime rates. As we have data on sentencing for adults and juveniles separately, we analyse the effects of sentencing for both age groups jointly and then separately. Total crime committed by the juvenile offenders is lower than adult offenders. However, young people are over-represented in the criminal justice system.<sup>4</sup> Therefore, it is useful to analyse the effects of sentencing juvenile offenders on crime rates separately from adult offenders.

<sup>4</sup>In 2012/13 police made around 1.07 million arrests. 11.8 per cent of those (total of 126,809) were young people aged 10–17 and for notifiable offences. In that year, young people accounted for 10.5 percent of the offending age population (aged 10 years or older) suggesting that young people are over-represented in the criminal justice system.

Our data show us at each PFA<sup>5</sup> in England and Wales (from 2002 to 2013) how many crimes have been recorded in four different crime categories—violence against the person, sex offences, robberies and property crimes. These four crime categories account for around 90 per cent of total crimes recorded across England and Wales between 2002 and 2013 (Appendix 1). The majority of offences were categorized under the property crime category. Table A2 in the Appendix 2 shows the composition of the property crime. The main categories are criminal damage, all other theft offences, vehicle thefts and burglary offences. For violent crimes, violence against the person accounts for the majority of the total violent offences recorded (Appendix 3).

Our dependent variable is crime rate per 1,000 people for each PFA for each time period. Our analysis includes violence against the person, sex offences, robbery and property crimes. As we are interested in how sentencing works and how alternatives to custody affect crime rate, we derive ‘sentence-conviction rate’ calculated by taking the total number of criminals sentenced to, e.g., custody in the particular year in each PFA and dividing that number by the total number of crimes registered in each PFA that year and multiplying it by 100 to derive a rate. ‘Sentence-conviction rate’ can be represented as follows:

$$\text{‘Sentence - conviction rate’} = \frac{\text{Total Number Sentenced per Sentence Type}_{\text{crime type, year}}}{\text{Total Number of Crimes}_{\text{crime type, year}}} * 100'$$

We do this for all crime types listed earlier. Our derived conviction rate for each sentencing type (and for each offence type) is correlated with detection rate as only the detected crimes get sentences issued to the offenders. Conviction rate is sometimes used as a proxy for detection rate (Machin and Meghir 2004). Moreover, this type of conviction rate allows us to look into each sentencing type separately. Although we have sentencing data separated for adult and juvenile offenders and the effect of that can be captured separately, recorded crime rate has a victim but cannot be matched with an offender (in a large percentage of cases we do not even know who the offender is), and thus we cannot separate our dependent variable to crime rate for adult offenders only or for juvenile offenders only. Therefore, we run two empirical models—one with total sentence-conviction rate for all of the offenders and another one where sentence-conviction rate is separated for adult and juvenile offenders. Descriptive statistics for all four crime types averaged for 2002–2013 period are reported in Table 1.

We include data on unemployment and proportion of youth population to control for socio-economic factors that could contribute to changes in crime rates. Also, we include a total of police officers’ salaries to represent the strength of police presence and might affect crime rates. Unemployment rate is defined as a proportion of unemployment benefits claimants to the total number of people in the workforce. We obtained unemployment figures from Labour Force Survey and Annual Population Survey. Unemployment data are available yearly at each PFA level. Police officers’ salaries are the totals (in £’000) of how much each PFA spent yearly on police officers’ salaries. The variable youth population is defined as a proportion of young people aged 15–24 years to the entire population. The data source is mid-year estimated population

<sup>5</sup>We use data for all PFAs apart from the City of London because it is a small area that contains the Central Criminal Court of England and Wales (colloquially known as the Old Bailey) which tries cases from outside the area.

TABLE 1 *Descriptive statistics*

Dependant variables	Mean	Std. Dev.
Violence against the person (VATP)—rate per 1,000 people	12.18	3.08
Sex offences—rate per 1,000 people	0.96	0.21
Robbery—rate per 1,000 people	0.91	0.94
Property crime—rate per 1,000 people	58.27	19.24

Note: All crime rates are defined as the number of offences per 1,000 population; there is total 504 PFA—year observations in the sample (42 PFA by 12 years)

by age and gender from National Statistics. The number of people aged 15–24 years has been calculated by aggregating each year group at local authority level and then aggregating into PFAs according to their geographic boundaries. Descriptive statistics for conviction rates and socio-economic variables are reported in [Appendix 4](#).

*Empirical model*

The econometric specification of our main model is as follows:

$$\begin{aligned}
 CrimeRate_{i,t} = & \beta_1 CommunitySent_{i,t-1} + \beta_2 Custody_{i,t-1} + \beta_3 ConditionalDischarge_{i,t-1} \\
 & + \beta_4 Fine_{i,t-1} + \beta_5 SuspendedSentence_{i,t-1} + \beta_6 PoliceOfficersSalaries_{i,t} \\
 & + \beta_7 Unempl_{i,t} + \beta_8 Youth_{i,t} + \sigma_i + \mu_t + \varepsilon_{i,t}
 \end{aligned}$$

where  $i$  represents the cross-section unit of observation (in this case each PFA),  $t$  represents time,  $\sigma_i$  is the unknown intercept for each PFA,  $\mu_t$  represents year fixed effects to account for PFA specific year changes, and  $\varepsilon_{i,t}$  is the error term. The explanatory variables, *CommunitySent* stands for the conviction rate for all offenders who get a community sentence, *Custody* is the conviction rate for all offenders who are issued a custodial sentence, *ConditionalDischarge* is the conviction rate for all offenders who received conditional discharge as a sentence for the crime they have committed, *Fine* is the conviction rate for the offenders who were fined, *SuspendedSentence* is the conviction rate for all offenders who received suspended sentence. Also, *PoliceOfficersSalaries* stands for total cost of police salaries, *Unempl* for unemployment rate and *Youth* for the ratio of people aged 15–24 in the population.

We use PFA-level fixed effects to eliminate unobserved area-specific time-invariant effects and thus control for the average differences across PFAs for any observable or unobservable predictors, such as differences in size, characteristics etc. In that way, the fixed-effect coefficients control for all the across-PFA variation and we are left with the within-PFA variation, which helps us greatly reduce the problem of omitted variable bias. We also include fixed time effects in our model as the year dummies pick up any variation in the outcome that happen over time and that is not attributed to our other explanatory variables.

For conviction rates we use lagged variables in order to minimize possible issues with the endogeneity that arises due to possible reverse causality between our dependent variable—crime rate—and conviction rate as both of them can have an effect on each other. Including a time lag on conviction rate minimizes the effect as crime rate this year cannot affect the conviction rate last year.

Alongside our main model, we also test the relationship between crime rates and conviction rates for adult and juvenile offenders separately, keeping the rest of the model unchanged. However, since sentences issued to the offenders for violent crimes and property crime vary and there are more non-custodial sentences used for both adult and juvenile offenders for property crime offences, the econometric specification differs slightly between violent and property crimes as we include more non-custodial sentences for juvenile offenders in the latter. Both of these specifications can be found in [Appendix 5](#).

### Results

The empirical results of our main model are presented in [Table 2](#) later. They are presented in elasticity form that was derived from level-level coefficients ([Appendix 6](#)) using sample means (with confidence interval reported at 95% level of significance) in order to make the interpretation easier.

For violence against the person offences the conviction rate for community sentence has a negative but insignificant effect of 0.04 per cent. However, the conviction rate for the custody has a negative and significant coefficient. A 1 per cent increase in the conviction rate for the custody would reduce crime rate by 0.2 per cent. Coefficients of the conviction rates for conditional discharge and suspended sentence are both negative but insignificant, and the coefficient of the conviction rate for fines is positive but insignificant.

TABLE 2 *Fixed-effects regression models predicting change in crime rates, in elasticity form, 2002–2013*

	VATP	Sex offences	Robbery	Property crime
Conviction rate for community sentence ( $t-1$ )	-0.04 (-0.11; 0.03)	-0.03 (-0.09; 0.03)	-0.1*** (-0.15; -0.04)	-0.2*** (-0.3; -0.12)
Conviction rate for custody ( $t-1$ )	-0.2*** (-0.31; -0.1)	-0.12*** (-0.18; -0.06)	0.05 (-0.04; 0.13)	-0.15** (-0.26; -0.03)
Conviction rate for conditional discharge ( $t-1$ )	-0.01 (-0.05; -0.03)	-0.02** (-0.03; -0.001)	-0.001 (-0.003; 0.005)	0.04 (-0.02; 0.11)
Conviction rate for fine ( $t-1$ )	0.01 (-0.02; 0.04)	0.0004 (-0.001; 0.02)	0.0003 (-0.001; 0.001)	0.06** (0.001; 0.12)
Conviction rate for suspended sentence ( $t-1$ )	-0.03 (-0.07; 0.01)	-0.02 (-0.04; 0.01)	0.03 (-0.02; 0.06)	0.00008 (-0.02; 0.07)
Police officers' salaries	0.0008 (-0.02; 0.04)	0.03 (-0.03; 0.05)	0.01 (-0.06; 0.09)	0.0007 (-0.05; 0.05)
Unemployment	-0.12** (-0.23; -0.02)	-0.06 (-0.19; 0.06)	-0.39* (-0.82; 0.07)	-0.14*** (-0.26; -0.05)
Youth aged 15–24	-0.23 (-0.79; 0.32)	-0.27 (-0.93; 0.4)	1.4** (0.15; 2.62)	0.41** (0.002; 0.85)
Fixed time effects	Yes	Yes	Yes	Yes
Number of observations	462	462	462	462
$R^2$ (within)	0.71	0.4	0.51	0.9

Note: dependant variable is the crime rate per 1,000 people, CI at 95% reported in parenthesis. Coefficients are significant at the 10%, 5% and 1% level and are marked \*, \*\*, \*\*\*, respectively. Results are converted to elasticity form using sample means from the level-level results reported in the [Appendix 6](#). VATP = violence against the person.



For sex offences, the conviction rate for community sentence is negative but insignificant as was the case for violence against the person. However, custody has negative and significant effect on sexual offences rate, suggesting that a 1 per cent increase in the conviction rate for custody would reduce crime rate by 0.12 per cent. This is similar to our finding for violence against the person. The effect of conditional discharge is different as for sexual offences the effect is negative and significant. A 1 per cent increase in the conviction rate for conditional discharge would reduce crime rate by 0.02 per cent. Conviction rates for fine and suspended sentence are positive and negative, respectively, but both are insignificant.

For robbery offences, the impact of more convictions leading to a community sentence is negative and significant. A 1 per cent increase in the conviction rate for community sentence reduces crime rate by 0.1 per cent. The conviction rate for the custody is positive and insignificant and that is the opposite effect that we found for the violence against the person and sexual offences. This suggests that sentencing types can have different effects on different crime types. For example, if community sentence is not an effective way to combat one crime type it does not mean that it cannot be effective for a different offence category. Other conviction rates for sentencing are insignificant.

For property offences, which is the only economic crime type in our analysis, both conviction rates for the community sentence and for the custody are significant and negative. A 1 per cent increase in the conviction rate for the community sentence would reduce crime rate by 0.2 per cent whereas a 1 per cent increase in the conviction rate for the custody would reduce it by 0.15 per cent. This suggests that alternatives to custody can sometimes be more effective than incarceration. Conviction rates for the conditional discharge and suspended sentence are both insignificant. However, conviction rate for fines is positive and significant. A 1 per cent increase in the conviction rate for the fine would increase property crime rate by 0.06 per cent. Because it is an economically motivated crime, it is possible that paying fines reduces the offender's income. Therefore, more crime could be encouraged thereafter in order to compensate for the financial losses fines have imposed.

Other explanatory variables—unemployment, police officers' salaries and proportion of youth in the population—were also included in our analysis. For violence against the person offences only unemployment has a significant effect of 0.12 per cent reduction if increased by 1 per cent. For sex offences all of the variables are insignificant. For robbery offences unemployment has a negative and significant coefficient, a 1 per cent increase in unemployment reducing crime rate by 0.39 per cent. Also, the youth variable is positive and significant. A 1 per cent increase in youth population would increase robbery rate by 1.4 per cent. This is different from violence against the person and sexual offences. This may reflect the different economic motivations associated with robbery compared to other forms of violence. For property crime, unemployment has a negative and significant co-efficient, a 1 per cent increase in unemployment would reduce crime by 0.14 per cent. The youth variable is positive and significant, and it suggests that a 1 per cent increase in youth population would increase the property crime rate by 0.41 per cent.

Overall, our results suggest that alternatives to custody can be as effective in reducing crime rates as incarceration, for certain crime types. Given that the drivers of property and violent crime may be different this variation should not be *a priori* surprising,

the literature does not find consistent impacts of law enforcement and socio-economic factors across crime types and as we have explained the net effect of custody as well as non-custodial alternatives comprise of effects that act in different directions (see the Discussion section).

Specifically, we find that alternatives to custody are effective for both property crime and robbery. It should be noted that although violence against the person, sexual offences and robbery are all classified as violent crimes, robbery in fact does not always contain a violent action by definition.<sup>6</sup> Therefore, robbery can have an economic motive similar to property crime. We can see from our findings that community sentences have a larger and more significant impact on those two offence types. As discussed earlier, custodial sentences can affect offenders' future employment, and therefore, income opportunities that might increase further economic motives for committing crimes in the future. It has also been found that robbery is often a group crime (van Mastrigt and Farrington 2009) and prison may therefore increase access to criminal networks increasing future offending opportunities. However, this is not the case for violence against the person and sexual offences where motives are not rooted in economic incentives nor is access to criminal networks as important. This can explain in part why we find that violent and sexual offences are more affected by custodial sentences (perhaps mainly through an incapacitation effect or through more intense treatment programmes in prison). Robbery and property crime can be managed at least as effectively by community sentences, though fines can be counterproductive as it increases the economic motivation to commit crime for people at the margin. The ineffectiveness of community sentences for sexual offending may also reflect the inadequacy of community programmes for sex offenders during our period of analysis.

Table 3 reports our findings about the relationship between crime rates and conviction rates for adult and juvenile offenders separately. As with the main results table, these results are presented in the elasticity form, which was derived from level-level coefficients (Appendix 7) using sample means in order to make the interpretation easier.

The results for adult and juvenile offenders show that community sentences are more effective on adult than on juvenile offenders when it comes to addressing property crime. In our main specification, the effect was negative and significant for robbery and property crimes. However, while holding for the adult offenders for both crime types, the results lose significance for robbery for juvenile offenders. For fines it has exactly the opposite effect on property crime, suggesting the juvenile's parent or guardian paying the fine may be deterring the juvenile from further criminality. Results also differ when it comes to custody. In our main specification, custody showed a negative effect on violence, sexual offences and property crime. The effects for these crimes are the same for adult offenders. But for juvenile offenders only custody for violence against the person has any significant impact, and the effect on sex offences and property crime becomes insignificant. This may reflect different motivations for adults and

<sup>6</sup>A person is guilty of robbery if he steals, and immediately before or at the time of doing so, and in order to do so, he uses force on any person or puts or seeks to put any person in fear of being then and there subjected to force.' (Theft Act 1968, Chapter 60).

TABLE 3 *Fixed-effects regression models predicting change in crime rates, in elasticity form, 2002–2013, broken by adult and juvenile offenders*

	VATP	Sex offences	Robbery	Property crime
Adult conviction rate for community sentence ( <i>t</i> -1)	0.02 (-0.05; 0.09)	-0.02 (-0.06; 0.02)	-0.02* (-0.05; 0.002)	-0.16*** (-0.27; -0.06)
Adult conviction rate for custody ( <i>t</i> -1)	-0.16*** (-0.26; -0.06)	-0.12*** (-0.17; -0.06)	0.06* (-0.01; 0.11)	-0.12** (-0.24; -0.005)
Adult conviction rate for conditional discharge ( <i>t</i> -1)	-0.05** (-0.09; -0.01)	-0.01** (-0.03; -0.0003)	0.0015 (-0.001; 0.004)	0.03 (-0.03; 0.09)
Adult conviction rate for fine ( <i>t</i> -1)	-0.03* (-0.06; 0.01)	0.005 (-0.01; 0.02)	0.0002 (-0.01; 0.001)	0.06* (0.002; 0.12)
Adult conviction rate for suspended sentence ( <i>t</i> -1)	-0.09*** (-0.13; -0.05)	-0.01 (-0.04; 0.01)	0.02 (-0.02; 0.06)	0.02 (-0.02; 0.07)
Juvenile conviction rate for community sentence ( <i>t</i> -1)	-0.003 (-0.06; 0.04)	-0.02 (-0.04; 0.01)	-0.06** (-0.12; -0.03)	0.009 (-0.09; 0.07)
Juvenile conviction rate for custody ( <i>t</i> -1)	-0.03** (-0.06; 0.002)	0.01 (-0.02; 0.04)	-0.02 (-0.06; 0.02)	-0.02 (-0.07; 0.02)
Juvenile conviction rate for conditional discharge ( <i>t</i> -1)				-0.005 (-0.04; 0.04)
Juvenile conviction rate for fine ( <i>t</i> -1)				-0.02*** (-0.04; -0.006)
Police officers' salaries	-0.005 (-0.02; 0.04)	0.02 (0.03; 0.05)	0.02 (-0.06; 0.09)	0.01 (-0.05; 0.05)
Unemployment	-0.12** (-0.23; -0.02)	-0.08 (-0.19; 0.03)	-0.39* (-0.82; 0.07)	-0.14*** (-0.25; -0.05)
Youth (aged 15–24)	-0.2 (-0.79; 0.39)	-0.27 (-0.93; 0.4)	1.26** (0.04; 2.62)	0.34* (-0.002; 0.7)
Fixed time effects	Yes	Yes	Yes	Yes
Number of observations	462	462	462	462
R <sup>2</sup> (within)	0.74	0.4	0.51	0.9

Note: dependant variable is the crime rate per 1,000 people, CI at 95% reported in parenthesis. Coefficients are significant at the 10%, 5% and 1% level and are marked \*, \*\*, \*\*\*, respectively. Results are converted to elasticity form using sample means from the level-level results reported in the Appendix 7. VATP = violence against the person.

juveniles as also the fact that juveniles make up a smaller part of the sample of offenders and may have less of an impact on overall crime.

On the other hand, the conviction rate for custody for adult offenders now has a positive and significant effect on robbery offences showing that a 1 per cent increase in the conviction rate for custody would increase robbery rate by 0.06 per cent. Once offenders are separated by adults and juveniles the alternatives to custody show more impact on the violent crimes. In the main specification, only custody was significant. For adult offenders taken separately, however, the conviction rates of the conditional discharge, fines and suspended sentence became negative and significant showing that a 1 per cent increase of those conviction rates would lower the crime rate by 0.05 per cent, 0.03 per cent and 0.09 per cent, respectively. Overall, these results show, like our main model, that alternatives to custody can work effectively to reduce crime. In addition, adult and juvenile offenders react differently to changes in sentencing. Although none of the results became significant for juvenile offenders from what was already significant in the main specification, when considering adult offenders alone, more types of alternatives to custody sentencing were found to be significant for reducing crime rates.

*Robustness checks**Impact of financial crisis on the crime–sentencing relationship*

For robustness, we check whether our model coefficients are stable when we consider the possible implication of the financial crisis in 2008–2009 given its adverse impact on unemployment and basic earning (Campos *et al* 2010). Further, criminal justice agencies faced significant budget cuts and the Coalition government’s 2010 spending review called for police budgets to be reduced by 20 per cent (Millie and Bullock 2012). Thus, rising unemployment, falling incomes and lower police budgets might have well-affected crime rates.

In order to test if our model is stable we include a dummy variable for post-recession years (2007<) and interactions of all explanatory variables with that dummy with the rest as before.

The recession dummy is set to be equal to 0 for years before 2008 and 1 thereafter, with the dummy variable representing a level shift change in crime, e.g., a positive coefficient would indicate a level increase in crime in post-recession years.

Appendix 8 contains detailed results of the empirical models tested earlier. The recession dummy itself is positive and significant for all crime categories, suggesting a level shift as a result of the financial crisis. Most interaction dummies for various sentencing types are not significant suggesting that marginal impact of various sentencing types does not vary across different phases of the business cycle. The signs and size of the main coefficients when compared to our main models for violent and property crimes do not change much.

*Lagged specification*

We changed the contemporaneous socio-economic variables in the main model to the one period lagged values of these variables. This specification addresses the potential issue of these variables affecting crime rate with a lag. The results are similar to the main results reported earlier (see Appendix 9 for detailed results).

*Discussion*

Our results suggest that although custody is an effective way of reducing crime for most crime types, it is not the only way to do so. In fact, custody can sometimes have a detrimental effect on crime. For example, robbery has a positive and significant relationship with the adult conviction rate for custody. This suggests that the criminogenic effects for adult offenders in custody for robbery might be stronger than for violence against the person, sex offences and property crime where custody had a negative impact on all the three the crime rates. Alternative sentences such as community sentence and conditional discharge also reduced crime rates for all three violent crimes except fines for adult offenders, suggesting that crime can be reduced by routes other than prison. In order to illustrate how a 1 per cent increase in the conviction rate affects the total number of offences, we have calculated the following for the adult offenders based on recorded crime in the United Kingdom in 2014. Our calculations also report upper and

lower bounds of the estimated numbers (based on the estimated confidence intervals at 95% level of significance) (Table 4).

We can see, for Violence Against the Person, more than 1,000 offences would be prevented if there was a 1 per cent increase in the conviction rate for custody (for adult offenders). However, almost the same number of offences could be prevented if there was 1 per cent increase in conditional discharges and 1 per cent increase in suspended sentences. For robbery, no such impact from additional sentencing is found as we discussed. 98 per cent of sexual offence convictions result from crimes committed by adult offenders. Increases in both custody and conditional discharges prevent further offences. However, a 1 per cent increase in the conviction rate for custody for adult offenders prevents over six times more offences than 1 per cent increase in the conviction rate for conditional discharge.

Similarly, Table 5 illustrates estimated effects of sentencing 1 per cent more adult offenders to custody and community sentence in terms of prevented offences for property crime.

Although both community sentence and custody are effective at reducing property crime, community sentence is more effective.

TABLE 4 *Number of offences of violent crimes could be changed by changing the type of sentencing issued by 1%*

Offence type	Violence against the person	Robbery	Sexual offences
Total number of offences recorded by the police (by <i>adult offenders</i> )	720,833	48,585	78,609
Estimated change in a number of offences after 1% increase in custody <sup>7</sup>	-1,153 [-432, -1874]	+29 [26, 32]	-94 [-141, -47]
Estimated change in a number of offences after 1% increase in community sentence		-10[-24, 4]	
Estimated change in a number of offences after 1% increase in conditional discharge	-360 [-648, -72]		-8 [-16, 0]
Estimated change in a number of offences after 1% increase in suspended sentence	-649 [-937, -361]		

TABLE 5 *Number of offences of property crimes could be changed by changing the type of sentencing issued by 1%*

Property crime	Custody	Community sentence
Estimated change in a number of offences (total offences 2,244,167) <sup>7</sup>	-2,693 [-4937, -449]	-3,590 [-5610, -1570]

Note: Estimated impact of sentencing 1% more offenders to each sentence type on number of recorded crimes in 2014 for adult offenders.

<sup>7</sup>All these estimated are based on the data for 2013–2014 crime trends from <https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/bulletins/crimeinenglandandwales/2015-04-23> and [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/399379/youth-justice-annual-stats-13-14.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/399379/youth-justice-annual-stats-13-14.pdf)

We find that for some offence types, there are credible alternatives to custody that are either superior or approximately equivalent to a prison sentence in terms of impact on the local crime rate. However, what that alternative is depends on the type of offence and, also on whether the offender is adult or juvenile. The variation of the relative impact of these measures across crime types is not surprising given the diverse motivations and characteristics of different offender types. That the drivers vary across crime types has been theorized and shows up in the magnitudes of different determinants of crime types in the literature (see Loureiro *et al.* (2009) and Engelen *et al.* (2016) for why property and violent crime have different underlying motivations).

In terms of the impact of custody on crime, we have discussed several effects in the introduction, namely general and specific deterrence as well as incapacitation, which lead to a reduction in crime while prison is associated with criminogenic effects that act in the opposite direction. The magnitudes of these effects, in particular deterrence and criminogenic effects may vary by crime type and indeed by adult or youth. The effectiveness of alternatives to custody depends on the type of alternative and its intensity. For example, property crimes are often economically motivated and fines may increase the economic impetus by lowering a person's income and perversely leading to further criminal activity. On the other hand for juveniles, it is likely that the fines are paid by the parent or guardian who may have an incentive to try and stop the juvenile from offending. At the same time the criminogenic effects of prisons could be stronger for offenders convicted of robbery because of the greater likelihood of them meeting potential future co-offenders while incarcerated. The ineffectiveness of community sentences on sexual offending may reflect the ineffectiveness of current regimes of treating sexual offenders in the community.

### *Limitations*

We estimate a reduced-form model to show the effect of alternative sentencing types on different crime types. Although we provide a robust analysis of the problem, there are some limitations of our work. First, as we are estimating a reduced-form as opposed to a structural model, we suggest readers use caution before attaching a causal interpretation to our estimates. Although a structural model is beyond the scope of this article, we take several steps to make sure that we are not estimating a spurious correlation between crime rates and alternative sentencing due to the presence of unobserved variables. Under the assumption of time-invariant unobservables, our fixed-effect estimation strategy effectively removes the impact of such variables from our sentencing estimates. However, fixed-effect estimation strategy does not address any correlation that might still exist with time-varying unobserved variables. We also minimize the issue of time-varying unobservables by incorporating some of the key time-varying variables that could impact crime rate (e.g., PFA unemployment rate, PFA proportion of youths and time fixed-effects).

Second, our study is also likely to be impacted by data quality issues such as measurement error and under-reporting of certain crime variables. For example, a measurement error in the sentencing variables will lead to a downward bias in our fixed-effect estimates. Third, our study is conducted at PFA level. Because PFA is not a natural economic unit of analysis such as individuals or counties/districts, one concern is that our study lacks ecological validity. However, although PFA is not a natural economic

unit, from a law-order perspective PFA is an ecologically valid unit since crime-fighting resources are organized accordingly. Nonetheless, we should be careful not to extrapolate PFA level conclusions to propose policies that target specific individuals or groups.

### *Conclusion*

This study explores the urgent question of whether and which alternatives to custody can substitute for incarceration. We examine England and Wales, a region with one of the highest prison populations in Europe and where recent policy has tried to reduce reliance on incarceration. We identify a hitherto unused data set on sentencing practice at the PFA level. We find that community sentences appear to be effective substitutes for custody when addressing property crime and robbery, but not for other types of violent crime. Because custody typically costs more than alternatives (besides the significant social disadvantages), our results suggest that there may be scope to provide for public protection through the criminal justice system more efficiently and humanely than the status quo. The results also suggest that policies implementing alternatives to custody in England and Wales may have already produced moderate success in terms of offering credible alternatives to sentencing judges, even though they have not yet significantly reduced reliance on incarceration as a criminal justice strategy.

These conclusions are, of course, tempered with the caveats we mention in the previous section and we hope that this will spur further work using individual level data on specific interventions that will complement and enrich our analysis.

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### Appendix 1

TABLE A1. Composition of total recorded crime in England and Wales 2002–2013

Composition of total recorded crime, England and Wales, 2002–2013, % distribution	
Total violent crime	18.3
Property crime	71.7
Fraud	0.2
Other crime against society	9.8

### Appendix 2

TABLE A2. Composition of property crime in England and Wales 2002–2013

Composition of property crime, England and Wales, 2002–2013, % distribution	
Burglary offences	18.1
Theft from the person	3
Shoplifting	9.2
Criminal damage	27.1
Vehicle offences	19.3
Bicycle theft	3
All other theft offences	20.3

### Appendix 3

TABLE A3. Composition of violent crimes in England and Wales 2002–2013

Composition of violent crime, England and Wales, 2002–2013, % distribution	
Violence against the person	83.8
Sex offences	6.5
Robbery	9.8

*Appendix 4*

*TABLE A4. Descriptive statistics*

Explanatory variables	Mean	Std. Dev.
VATP—conviction rate for community sentence	1.59	0.72
VATP—conviction rate for custody	1.65	0.56
VATP—conviction rate for conditional discharge	0.19	0.11
VATP—conviction rate for fine	0.2	0.11
VATP—conviction rate for suspended sentence	0.69	0.54
VATP—adult conviction rate for community sentence	1.12	0.53
VATP—adult conviction rate for custody	1.55	0.53
VATP—adult conviction rate for conditional discharge	0.17	0.1
VATP—adult conviction rate for fine	0.19	0.12
VATP—adult conviction rate for suspended sentence	0.69	0.54
VATP—juvenile conviction rate for community sentence	0.47	0.24
VATP—juvenile conviction rate for custody	0.1	0.06
Sex offences—conviction rate for community sentence	2.72	1.01
Sex offences—conviction rate for custody	5.73	1.77
Sex offences—conviction rate for conditional discharge	0.27	0.26
Sex offences—conviction rate for fine	0.28	0.34
Sex offences—conviction rate for suspended sentence	0.63	0.51
Sex offences—adult conviction rate for community sentence	2	0.78
Sex offences—adult conviction rate for custody	5.57	1.72
Sex offences—adult conviction rate for conditional discharge	0.24	0.23
Sex offences—adult conviction rate for fine	0.26	0.3
Sex offences—adult conviction rate for suspended sentence	0.63	0.51
Sex offences—juvenile conviction rate for community sentence	0.73	0.43
Sex offences—juvenile conviction rate for custody	0.17	0.18
Robbery—conviction rate for community sentence	3.33	1.86
Robbery—conviction rate for custody	11.58	7.03
Robbery—conviction rate for conditional discharge	0.04	0.16
Robbery—conviction rate for fine	0.34	0.31
Robbery—conviction rate for suspended sentence	0.76	0.95
Robbery—adult conviction rate for community sentence	0.7	0.75
Robbery—adult conviction rate for custody	9.87	6.6
Robbery—adult conviction rate for conditional discharge	0.02	0.08
Robbery—adult conviction rate for fine	0.02	0.2
Robbery—adult conviction rate for suspended sentence	0.76	0.95
Robbery—juvenile conviction rate for community sentence	2.63	1.65
Robbery—juvenile conviction rate for custody	1.7	1.1
Property crime—conviction rate for community sentence	1.64	0.58
Property crime—conviction rate for custody	0.99	0.35
Property crime—conviction rate for conditional discharge	0.84	0.41
Property crime—conviction rate for fine	0.62	0.33
Property crime—conviction rate for suspended sentence	0.23	0.2
Property crime—adult conviction rate for community sentence	1.14	0.47
Property crime—adult conviction rate for custody	0.94	0.34
Property crime—adult conviction rate for conditional discharge	0.79	0.4
Property crime—adult conviction rate for fine	0.6	0.32
Property crime—adult conviction rate for suspended sentence	0.23	0.2
Property crime—juvenile conviction rate for community sentence	0.5	0.18
Property crime—juvenile conviction rate for custody	0.05	0.02
Property crime—juvenile conviction rate for conditional discharge	0.06	0.03
Property crime—juvenile conviction rate for fine	0.02	0.02
Unemployment	5.85	2.2
Police officer's salaries	251.86	145.24
Youth aged 15–24 years	12.76	1.16

VATP = violence against the person.

## Appendix 5

The econometric specification of the model for violence against the person, robbery and sex offences is as follows:

$$\begin{aligned}
 CrimeRate_{i,t} = & \beta_1 AdultConvictionCS_{i,t-1} + \beta_2 AdultConvictionCust_{i,t-1} \\
 & + \beta_3 AdultConvictionCD_{i,t-1} + \beta_4 AdultConvictionF_{i,t-1} + \beta_5 AdultConvictionSS_{i,t-1} \\
 & + \beta_6 JuvenileConvictionCS_{i,t-1} + \beta_7 JuvenileConvictionCust_{i,t-1} \\
 & + \beta_8 PoliceOfficersSalaries_{i,t} + \beta_9 Unempl_{i,t} + \beta_{10} Youth_{i,t} + \sigma_i + \mu_t + \varepsilon_{i,t}
 \end{aligned}$$

where  $i$  represents the cross-section unit of observation (in this case each PFA),  $t$  represents time,  $\sigma_i$  is the unknown intercept for each PFA,  $\mu_t$  represents year fixed effects to account for PFA specific year changes, and  $\varepsilon_{i,t}$  is the error term. The explanatory variables, *CommunitySent* stands for the conviction rate for all offenders who get a community sentence, *Custody* is the conviction rate for all offenders who are issued a custodial sentence, *ConditionalDischarge* is the conviction rate for all offenders who received conditional discharge as a sentence for the crime they have committed, *Fine* is the conviction rate for the offenders who were fined, *SuspendedSentence* is the conviction rate for all offenders who received suspended sentence. Also, *PoliceOfficersSalaries* stands for total cost of police salaries, *Unempl* for unemployment rate and *Youth* for the ratio of people aged 15–24 in the population.

The property crime econometric specification is as follows:

$$\begin{aligned}
 CrimeRate_{i,t} = & \beta_1 AdultConvictionCS_{i,t-1} + \beta_2 AdultConvictionCust_{i,t-1} \\
 & + \beta_3 AdultConvictionCD_{i,t-1} + \beta_4 AdultConvictionF_{i,t-1} + \beta_5 AdultConvictionSS_{i,t-1} \\
 & + \beta_6 JuvenileConvictionCS_{i,t-1} + \beta_7 JuvenileConvictionCust_{i,t-1} \\
 & + \beta_8 JuvenileConvictionCD_{i,t-1} + \beta_9 JuvenileConvictionF_{i,t-1} \\
 & + \beta_{10} PoliceOfficersSalaries_{i,t} + \beta_{11} Unempl_{i,t} + \beta_{12} Youth_{i,t} + \sigma_i + \mu_t + \varepsilon_{i,t}
 \end{aligned}$$

Besides the variables that are the same as the model earlier, we include the conviction rate for juvenile offenders who received a conditional discharge, labelled *JuvenileConvictionCD*, and the conviction rate for juvenile offenders who were fined for the property crime offences they have committed, labelled *JuvenileConvictionF*.

Appendix 6

TABLE A5. Fixed-effects regression models predicting change in crime rates, 2002–2013

Level–level results	VATP	SexOff	Robbery	Property
Conviction rate for community sentence ( <i>t</i> –1)	–0.29 (–0.78; 0.19)	–0.01 (–0.03; 0.01)	–0.03*** (–0.04; –0.01)	–7.07*** (–10.07; –4.07)
Conviction rate for custody ( <i>t</i> –1)	–1.52*** (–2.33; –0.71)	–0.02*** (–0.03; –0.01)	0.004 (–0.003; 0.01)	–8.56** (–15.56; –1.57)
Conviction rate for conditional discharge ( <i>t</i> –1)	–0.43 (–3.05; –2.18)	–0.06** (–0.11; –0.003)	–0.02 (–0.06; 0.1)	2.92 (–1.42; 7.25)
Conviction rate for fine ( <i>t</i> –1)	0.77 (–1.28; 2.82)	0.02 (–0.02; 0.06)	0.01 (–0.02; 0.04)	5.79** (0.09; 11.49)
Conviction rate for suspended sentence ( <i>t</i> –1)	–0.55 (–1.36; 0.26)	–0.03 (–0.07; 0.01)	0.03 (–0.02; 0.07)	5.74 (–6.65; 18.12)
Police officers' salaries	0.0004 (–0.001; 0.002)	0.0001 (–0.0001; 0.0002)	0.00004 (–0.0002; 0.0003)	0.003 (–0.01; 0.01)
Unemployment	–0.26** (–0.47; –0.05)	–0.01 (–0.03; 0.01)	–0.06* (–0.12; 0.01)	–1.43*** (–2.41; –0.45)
Youth aged 15–24	–0.23 (–0.75; 0.3)	–0.02 (–0.07; 0.03)	0.1** (0.01; 0.18)	1.88** (0.01; 3.75)
Fixed time effects	Yes	Yes	Yes	Yes
Number of observations	462	462	462	462
<i>R</i> <sup>2</sup> (within)	0.71	0.4	0.51	0.9

Note: dependant variable is the crime rate per 1,000 people, 95% level CI (in parenthesis). Coefficients are significant at the 10%, 5% and 1% level and are marked \*, \*\*, \*\*\*, respectively. VATP = violence against the person.

Appendix 7

TABLE A6. Fixed-effects regression models predicting change in crime rates, 2002–2013

Level–level results	VATP	SexOff	Robbery	Property
Adult conviction rate for community sentence ( <i>t</i> –1)	0.23 (–0.47; 0.92)	–0.01 (–0.03; 0.01)	–0.03* (–0.06; 0.003)	–8.26*** (–13.29; –3.23)
Adult conviction rate for custody ( <i>t</i> –1)	–1.26*** (–2.05; –0.46)	–0.023*** (–0.03; –0.01)	0.006* (–0.001; 0.01)	–7.53** (–14.74; –0.33)
Adult conviction rate for conditional discharge ( <i>t</i> –1)	–3.29** (–6.22; –0.37)	–0.06** (–0.11; –0.001)	0.07 (–0.06; 0.19)	2.47 (–1.86; 6.8)
Adult conviction rate for fine ( <i>t</i> –1)	–1.79* (–3.93; 0.35)	0.02 (–0.03; 0.07)	0.01 (–0.03; 0.06)	6.12** (0.24; 12.01)
Adult conviction rate for suspended sentence ( <i>t</i> –1)	–1.62*** (–2.41; –0.84)	–0.02 (–0.07; 0.02)	0.02 (–0.02; 0.07)	6.34 (–5.91; 18.59)
Juvenile conviction rate for community sentence ( <i>t</i> –1)	–0.23 (–1.35; 0.89)	–0.02 (–0.05; 0.01)	–0.02*** (–0.04; –0.01)	–1.04 (–9.75; 7.67)
Juvenile conviction rate for custody ( <i>t</i> –1)	–3.14* (–6.48; 0.2)	0.06 (–0.1; 0.23)	–0.01 (–0.03; 0.01)	–26.17 (–75.97; 23.63)

TABLE A6. *Continued*

Level-level results	VATP	SexOff	Robbery	Property
Juvenile conviction rate for conditional discharge ( $t-1$ )				-4.05 (-41.94; 33.84)
Juvenile conviction rate for fine ( $t-1$ )				-72.47*** (-126.64; -18.31)
Police officers' salaries	-0.0005 (-0.001; 0.002)	-0.00008 (-0.0001; 0.0002)	-0.00005 (-0.0002; 0.0003)	-0.03 (-0.01; 0.01)
Unemployment	-0.26** (-0.46; -0.05)	-0.013 (-0.03; 0.004)	-0.06* (-0.12; 0.01)	-1.41*** (-2.37; -0.45)
Youth aged 15-24	-0.19 (-0.75; 0.37)	-0.02 (-0.07; 0.03)	0.09** (0.003; 0.18)	1.55* (-0.01; 3.11)
Fixed time effects	Yes	Yes	Yes	Yes
Number of observations	462	462	462	504
$R^2$ (within)	0.74	0.4	0.51	0.9

Note: dependant variable is the crime rate per 1,000 people, 95% level CI (in parenthesis). Coefficients are significant at the 10%, 5% and 1% level and are marked \*, \*\*, \*\*\*, respectively. VATP = violence against the person.

### Appendix 8

TABLE A7. *Fixed-effects regression models predicting change in crime rates with recession*

Fixed-effects regression models predicting change in crime rates with recession interaction dummies, time trend, coefficients in elasticity form, 2002-2013	VATP	SexOff	Robb	Property
Conviction rate for community sentence ( $t-1$ )	0.06 (-0.03; 0.15)	-0.06 (-0.14; 0.29)	-0.08* (-0.11; 0.01)	-0.22*** (-0.37; -0.06)
Conviction rate for custody ( $t-1$ )	-0.33*** (-0.45; -0.2)	-0.12** (-0.24; 0.24)	-0.39*** (-0.51; -0.26)	-0.02 (-0.14; 0.09)
Conviction rate for conditional discharge ( $t-1$ )	-0.03 (-0.07; 0.01)	-0.01 (-0.03; 0.01)	-0.001 (-0.01; 0.01)	-0.01 (-0.11; 0.09)
Conviction rate for fine ( $t-1$ )	-0.003 (-0.05; 0.04)	0.01* (-0.0003; 0.02)	0.001 (-0.01; 0.01)	-0.04 (-0.12; 0.05)
Conviction rate for suspended sentence ( $t-1$ )	-0.1*** (-0.14; -0.06)	-0.09*** (-0.14; -0.04)	0.01 (-0.06; 0.08)	-0.07*** (-0.1; -0.03)
Police officers' salaries	0.02 (-0.02; 0.06)	0.03 (-0.03; 0.08)	0.03 (-0.06; 0.09)	0.02 (-0.05; 0.05)
Unemployment	0.09 (-0.3; 0.2)	-0.18** (-0.31; -0.03)	0.33 (-0.27; 0.89)	0.002 (0.51)
Youth (aged 15-24)	0.09 (-0.3; 0.5)	-0.53 (-1.34; 0.13)	0.58 (-0.43; 1.6)	0.4* (0.91)

TABLE A7. Continued

Fixed-effects regression models predicting change in crime rates with recession interaction dummies, time trend, coefficients in elasticity form, 2002–2013	VATP	SexOff	Robb	Property
Recession dummy (> 2007)	6.06*** (2.3; 9.81)	0.36** (0.01; 0.7)	0.65* (-0.13; 1.44)	30.16*** (8.14; 52.17)
Conviction rate for community sentence ( <i>t</i> -1)*recession	-0.06** (-0.1; -0.001)	0.003 (-0.05; 0.07)	-0.0002 (-0.05; 0.05)	0.02 (-0.07; 0.12)
Conviction rate for custody ( <i>t</i> -1)*recession	0.11** (0.01; 0.2)	0.04 (-0.04; 0.11)	0.25*** (0.17; 0.42)	-0.06 (-0.13; 0.02)
Conviction rate for conditional discharge ( <i>t</i> -1)*recession	0.03** (0.01; 0.05)	-0.003 (-0.02; 0.01)	-0.0004 (-0.01; 0.004)	0.02 (-0.05; 0.08)
Conviction rate for fine ( <i>t</i> -1)*recession	0.003 (-0.02; 0.03)	-0.01 (-0.01; 0.001)	-0.001 (-0.01; 0.01)	0.06** (0.007; 0.12)
Conviction rate for suspended sentence ( <i>t</i> -1)*recession	0.06** (0.01; 0.11)	0.05** (0.01; 0.1)	-0.01 (0.07; 0.06)	0.1*** (0.06; 0.15)
Police officers' salaries*recession	-0.01 (-0.03; 0.04)	-0.004 (-0.03; 0.03)	-0.01 (-0.06; 0.05)	-0.01 (-0.02; 0.01)
Unemployment*recession	-0.1*** (-0.17; -0.05)	0.04 (-0.08; 0.12)	-0.37*** (-0.68; -0.09)	-0.06** (-0.14; -0.004)
Youth (aged 15–24)*recession	-0.24*** (-0.45; -0.09)	-0.27** (-0.51; -0.04)	-0.22 (-0.8; 0.32)	-0.28*** (-0.53; -0.08)
Time trend	-0.27*** (-0.4; -0.14)	0.01** (0.002; 0.02)	-0.07*** (-0.09; -0.05)	-3.46*** (-4.11; -2.8)
Number of observations	462	462	462	462
R <sup>2</sup> (within)	0.73	0.30	0.60	0.91

Note: dependant variable is the crime rate per 1,000 people, 95% level CI (in parenthesis). Coefficients are significant at the 10%, 5% and 1% level and are marked \*, \*\*, \*\*\*, respectively. VATP = violence against the person.

## Appendix 9

TABLE A8. Fixed-effects regression models predicting change in crime rates with lagged socio economic variables, 2002–2013

Lagged specification, coefficients in elasticity form	VATP	SexOff	Robbery	Property
Conviction rate for community sentence ( $t-1$ )	-0.04 (-0.1; 0.03)	-0.04 (-0.09; 0.03)	-0.11*** (-0.15; -0.04)	-0.22*** (-0.31; -0.12)
Conviction rate for custody ( $t-1$ )	-0.21*** (-0.32; -0.1)	-0.12*** (-0.18; -0.04)	0.04 (-0.04; 0.13)	-0.14** (-0.26; -0.02)
Conviction rate for conditional discharge ( $t-1$ )	-0.007 (-0.05; 0.03)	-0.02** (-0.04; -0.002)	0.001 (-0.003; 0.005)	0.04 (-0.02; 0.1)
Conviction rate for fine ( $t-1$ )	0.01 (-0.02; 0.05)	0.006 (-0.006; 0.02)	0.0004 (-0.001; 0.001)	0.06** (0.006; 0.12)
Conviction rate for suspended sentence ( $t-1$ )	-0.03 (-0.07; 0.01)	-0.01 (-0.04; 0.01)	0.0003 (-0.01; 0.06)	0.02 (-0.03; 0.07)
Police officers' salaries ( $t-1$ )	0.02 (-0.002; 0.06)	0.03 (-0.01; 0.08)	-0.03 (-0.11; 0.11)	0.04 (-0.03; 0.09)
Unemployment ( $t-1$ )	-0.12** (-0.2; -0.005)	-0.12** (-0.18; 0.002)	-0.46** (-0.78; -0.07)	-0.14*** (-0.24; -0.05)
Youth 15–24 ( $t-1$ )	0.04 (-0.76; 0.84)	-0.13 (-0.8; 0.67)	2.18 (-0.87; 5.08)	0.34 (-0.22; 0.91)
Fixed time effects	Yes	Yes	Yes	Yes
Number of observations	462	462	462	462
$R^2$ (within)	0.71	0.40	0.52	0.90

Note: dependant variable is the crime rate per 1000 people, 95% level CI (in parenthesis). Coefficients are significant at the 10%, 5% and 1% level and are marked \*, \*\*, \*\*\*, respectively. VATP = violence against the person.