Prevalence and Frequency (working title)

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Abstract

These results illustrate that prevalence plays a much greater role in falling convictions rates than frequency. Population change showed an important impact in lowering conviction rates in the 990s but very little effect in reducing convictions since 2007. Once again, the impact of the prevalence, frequency and age structure is demonstrated to vary between men and women and for people of different ages.

Introduction

- Berg argues for prevalence and frequency as important concepts to describe the crime drop.
- Their analysis has limitations (age range, period range, men only)
- Our results show: differences across age, sex and time
- ... which are important to understand the crime drop

Previous Research

In the most straightforward definition, prevalence and frequency distinguish between the proportion of people who offend (prevalence18) and the rate at which those who do offend commit crime (frequency). This distinction raises the question for the study of criminal careers and the crime drop: does the crime drop reflect fewer people offending, people offending less, or some combination of the two (Berg et al. 2016)?

Using Prevalence and Frequency to Explore Change Over Time

Berg et al. (2016) use the distinction between prevalence and frequency to argue that splitting overall declines in crime into change due to prevalence and change due to frequency can be a useful way to understand overall change in crime rates. This distinction allows description of the "anatomy" of the crime drop in a way that aggregate analyses, which conflate the effects of prevalence and frequency, cannot (Berg et al. 2016). Understanding the anatomy of the crime drop is important for two reasons. First, differences in prevalence and frequency can be important in understanding the potential causes of changes in crime rates, as different theories of offending and of the crime drop may have different mechanisms which would be expected to work through either prevalence or frequency (Berg et al. 2016). Second, a crime drop driven prevalence would require different responses from the justice system than one driven by frequency. Blumstein et al. (1988a:7) suggest that reducing crime through lower prevalence would "relate to a general social policy of developing prevention strategies directed at the total population", whilst reducing crime through lower frequency "relates more narrowly to the identification of effective treatment or control alternatives for those who have begun to commit crimes".

with this aggregate focus the current analysis differs in its engagement with criminal justice policy from that of the original Criminal Careers report, which focused on impact of criminal justice sanctions at the individual level (Sampson and Laub 2016:329). The interest is less on understanding the convictions patterns of particular people and more on describing the aggregate convictions patterns and the implications that change in aggregate convictions patterns has for Scotland as a whole.

Despite this value there has been little empirical work to date in analysing changes in prevalence and frequency over the course of the crime drop22. To the author's knowledge, Berg et al.'s study is the only one consider such change is that of Berg et al. (2016). Berg et al. empirically explore change in prevalence and frequency using data from two waves of self-reported offending data in the Pittsburgh Youth Study, and their results show that there have been reductions in the prevalence and frequency of property crime, but serious violence saw declines in prevalence but not frequency. For drugs offences they found no decline in prevalence or frequency between the two cohorts. These results suggest that both prevalence and frequency may be important in reducing overall crime rates, and also emphasise the importance of considering trends for different crime types. Whilst an important reference point for the current study, there are limitations to Berg et al.'s (2016) account of change in prevalence and frequency. As their analysis is based on the Pittsburgh Youth Study, the results relate only to young men aged 17-18 in 1992- 1993 and 1998-1999.

Add Andersen and Sivertsson and slim down

Sivertsson (2018) analysed convictions histories for each cohort born between 1960 through 1984 from age 15 to age 30. He found different trends for men and women and for different crime types. For men, participation and frequency both declined from the 1960 to 1970 cohorts, at which point frequnecy increased through the 1984 cohort. For women, trends in participation and frequency both fall from 1960 to 1970, plateu, and then increase from 1975 onwards.

Increase in frequency for men due to drugs crime.

Distinct periods - 1960 to 1970 and 1970-1984.

First period of crime drop maps with general theories

Increase in prevalence of violent crime.

Andersen et al. (2016) examined whether the fall in youth convictions in Denmark was due to participation or frequency, finding that the decline was driven by participation rather than frequency. But it was really the 1994 and 1996 cohorts - *all* the cohorts analysed by Andersen are younger than those included in Sivertsson's analysis.

This fits very much with the Matthews and Minton finding of age-limited period or cohort effect?

And gives further justification of the "all-data" approach I take here

Sivertsson doesn't look at age structure, as he focuses on cohort change (not size of cohorts)

Andersen et al don't split by sex

Their results are therefore limited in its generalizability across both age and sex. Moreover, the account of Berg et al. (2016) only considers two of the three potential contributions to overall crime rates suggested by Blumstein et al. (1988), ignoring the potential confounding factor of change in population structure. Given the scope of the data used by Berg et al. (2016), no inferences can be drawn about change in prevalence and frequency after 1999. This raises the question of how prevalence and frequency have changed in more recent years. Finally, as with the recent analysis of change in the age-crime curve as discussed above, Berg et al. (2016) focus only on data from the USA. There is therefore value in examining the interaction between prevalence and frequency over the course of the crime drop in a different jurisdiction, given the questions regarding the capacity to generalize findings from studies of the crime drop in the USA to Europe.

So here's the statement of the gap in the literature

Explanations of the crime drop

Condense

Explanations of the crime drop The potential effects of policing and imprisonment on reducing convictions rates can also be explored by analysing changes in prevalence and frequency (Berg et al. 2016). In particular, the potential effects of policing or imprisonment in reducing crime rates are more likely to work through the frequency of offending rather than prevalence (Blumstein et al. 1986, MacLeod et al. 2012:5)52. Following this logic, Berg et al. (2016:6, citing Paternoster and Triplett 1988) suggest that "proactive policing" strategies and incarceration effects would primarily operate through changes in frequency rather than prevalence, as such strategies focus on active offenders or high-risk populations. However, the assertion that policing and imprisonment effects would manifest in changes in frequency rather than prevalence can only be made tentatively here, as such a contention does not account for other factors that may also have influenced prevalence and frequency. Moreover, given that policing and imprisonment make poor candidates for explanations of the international crime drop (Farrell 2013) this thesis does not discuss their impacts at length.

Prevalence and frequency and system effects

condense

As well as the justice system affecting the crime drop via strategies to reduce offending it is possible that the way in which cases are processed by the justice system may affected convictions trends (Aebi and Linde 2012). The work of Cohen (1985:44-45) suggests three possible ways in which such processing effects could be manifest. Changes in the operation of the justice system could lead to: new agencies or systems supplementing existing control mechanisms ("different nets"/diversion) leading to fewer convictions in courts; increases in the number of people who move into the system in the first place (due to "wider nets"); an increase in the "intensity of intervention" ("denser nets" [1985:44] or "thinning the mesh" [Cohen 1979:347]) leading to people circulating through the justice system at a higher rate. Each of these three effects is relevant to this investigation. Diversion or "different nets". The implementation of diversionary policies is a way in which changes in justice system practices could lead to fewer convictions being registered in SOI. Diversion could therefore provide an appearance of a crime drop in convictions data as low-rate offenders are kept out of courts and pushined in a different part of the justice system (Soothill et al. 2008).

In this scenaro, diversion may then lead to the appearance of increasing frequency of conviction or longer criminal careers as those who remain in the justice system are only more serious offenders (Francis et al. 2007).

Similar to Sivertsson?

For example, Soothill et al. (2008:91) conclude that there has been a shift to "smaller numbers of convicted offenders but with more (and more varied) convictions" in England and Wales between the early 1970s and late 1990s, which "may simply be the effect of system changes which have removed one-time offenders from the court arena" (2008:92) rather than behavioural changes which have reduced the number of people only committing one offence.

Second, the effects of diversionary policies may be particularly pronounced for young people, who can be particular targets for such policies (Soothill et al. 2004:412).

Net-widening

Net-widening occurs when offences which had previously not been prosecuted are punished within the justice system (Cohen 1985:44). As net-widening relates to the numbers of people coming into the justice system, it may influence the prevalence rather than frequency. All things being equal, increasing the number of low-rate offenders would logically lead to lower average frequency. Cohen (1985:53) suggests that net-widening particularly relates to those with "fewer previous arrests, minor or no offences... younger [or] female". Net-widening may therefore have a greater effect for women than men. Estrada et al. (2015) suggest that increases in convictions for violent offences for women are a product of net-widening, rather than offending, and Steffensmeier et al. (2005) make a similar contention in relation to arrests. Net-widening effects may affect women more than men because minor offences, which are those amenable to net-widening, comprise a greater proportion of offending by women as opposed to men (Estrada 2015:5, citing Cohen 1985).

Thinning the mesh/recycling.

As 'thinning the mesh' relates to the "intensity" of punishment (Cohen 1985:44) such a process would be expected to increase the frequency but not prevalence.

How can we distinguish system effects from behavioural effects?

Identifying system effects

Distinguishing between system and behavioural effects in convictions data is always difficult (Aebi and Linde 2012), and never definitive.

However, existing research suggests that three conditions suggest a potential system effect.

- First, there must be a plausible policy mechanism identified by an analysis of policy in the particular jurisdiction (Soothill et al. 2004, Aebi and Linde 2012). Identifying a potential mechanism requires an assessment of the type of crime affected by the potential system effect. For example, von Hofer (2000) suggests that the similarities in the timings of change in convictions rates across a number of types of crime may suggest system rather than behavioural effects if they also coincide with known policy changes. He illustrates this approach by describing change in convictions for a number of types of violence in Sweden in the 1980s which occurred at the same time as changes in reporting routines and a greater awareness of youth violence in Swedish society (von Hofer 2000:64-65, citing Estrada 1999). Therefore, von Hofer concludes, increases in reported youth violence during this period likely represent an effect of change in reporting practice.
- Second, that the timings of the hypothesised mechanism and the observed change in conviction trends must align.
- Third Soothill et al. (2004:415) suggest that, whilst not mutually exclusive, period effects observed in convictions data typically imply a system mechanism. On the other hand, if the causal mechanisms behind change in convictions patterns are behavioural this is likely to manifest in a cohort effect.
- Fourth, a potential system effect should not be apparent in other jurisdictions.

add Scottish context

Data and research design

Measures

When examining the combined effects of prevalence and frequency it is necessary to control for change in population composition. This requires measuring the age distribution of the population. This distribution is operationalized as the population agestructure, which shows the proportion of people in the population of a given age. In addition to standardizing by age-structure it is also possible to standardize by population size (Rosevear 2010:285-287). Using age-structure the emphasis on the shape of the population (rather than the size of the population), and consequently allows the analysis to focus on change in the overall rate of convicted offending rather than on the volume of convicted offending. This makes the results of the standardization and decomposition more comparable over time. To assess the robustness of findings using population structure rather than population size, Appendix Six presents the equivalent results calculated using numbers of people of different ages (rather than the proportion of the population of each age), which gives an estimate of the total number of convicted offences, rather than the convicted offending rate. Results of these two methods were substantively similar (see Section 7.3, footnote 126).

Defining prevalence and frequency

Prevalence is measured as the proportion of people with a convicted offence within a calendar year, expressed as a rate per 10,000 population. This is analysed both as rates of all people and all convictions as well as in age-specific rates. Frequency is measured as the mean number of convictions per person of each age convicted in a given year. This is a population average measure of frequency (Gottfredson and Hirschi 1987).

The frequency of conviction as measured in the SOI is likely to underestimate the total number of crimes for which a person is convicted due to the principal offence rule. This compounds the effect of lower frequency from convictions data than self-report data, as fewer convictions are served than there are crimes committed, and in SOI fewer convictions are recorded than crimes convicted.

Whilst this affects the comparison of this study's results with those of Berg et al. (2016) comparisons of the impact of the frequency of conviction made within the SOI over time should not be impaired, as the principal offence rule has been consistently applied. As such *change* in frequency over time can still be meaningfully analysed.

Methods

Data visuzliation

Link to ACC article

Standardization and decomposition

Standardization and decomposition are methods commonly used in demography to separate crude rates (in this case conviction rates) into contributions from different factors. As employed here, these techniques calculate the difference in convicted offending rates between years due to differences in the age-specific prevalence and frequency rates and the population structures in these years.

Standardization removes differences in convicted offending rate between comparison years due to differences in age-structure and age-specific prevalence and frequency rates in different years. Decomposition separates out the contributions of the different factors used in the standardization process (that is, age-structure, prevalence and frequency). These results can then identify the different contributions of the different factors used in the standardization.

Importantly, this analysis is not causal as the different effects identified by standardization and decomposition may themselves be the products of one (or more) variables not included in the standardization and decomposition analysis (Das Gupta 1993:4). Rather, standardization calculates what the convicted offending rate in the comparison years would have been, all else being equal, if these years had the same age-structure, prevalence and frequency as the baseline. Decomposition shows how much of this difference is attributable, again, all else being equal, to differences in age-structure, prevalence and frequency.

> Add comparison with other methods

Implementation

> export to a technical appendix

Results

Start with descriptive plots

Add ACC discussion and plot

Prevalence

Figure One, shows the change in the age-crime curve in Scotland in a shaded contour plot. This figure shows falls in convictions for young men from 1991 through 2015, but for young women onyl from 2007. For men and women aged 25-40 there are increases in conviction from 2000-2007. These results are discussed in more detail in Matthews and Minton (2018).

Frequency

Frequency of all conviction, 1989 and 2011

- Figure description
- Age trends description
- Sex trends description

Change in age structure

Having described changes in the frequency of convicted offending over the period covered by the SOI, focus now turns to examining change in age structure. Figure 7.5 shows a shaded contour plot of the numbers of men and women of different ages in Scotland between 1989 and 2011 for the ages 16 to 60. There are strong cohort effects when analysing change in age-structure because "given only one alternative, people age one year per year" (Minton 2014:54, citing Vonnegut 2005). The only deviation from cohort effects comes from migration and mortality. Strong cohort effects are evident in Figure 7.5, from the very clear diagonal contours.

This chart shows large cohorts of men and women between age 20 and 30 in 1989. These cohorts were born in the mid-to-late sixties – the children of the post-war baby boomers – and are indicated by the orange shading. These cohorts are of similar sizes (in numbers) for men and women, but comprise a slightly higher proportion of the male population than the female population. Following these baby boom cohorts were smaller 'baby bust' cohorts. Due to the ageing of the baby bust cohorts, and their replacement by cohort who continue to be smaller than the baby boom cohorts, the proportion of men and women between the ages of 20 and 30 is lower in 2011 than in 1989. Consequently in the first five years covered by SOI we see substantial change in the proportion of the population comprised of young people, but after this point the proportion of teenagers in the population remain mostly stable. This is shown by the smaller number of contours in the bottom-right of the plot. For cohorts born after 1980, there are increases in the proportion of the population aged 18 to 22 between the mid-2000s and 2011. These population increases, shown by the group of contours in the bottom-right of both plots (labelled 0.016 and 0.017 for men and labelled 0.015 for women), are due to migration in to Scotland during these ages and in particular due to students coming to Scotland to attend University and then moving out of Scotland after graduation (Scottish Government 2011:49). Whilst migration has increased the numbers of people between 18 and 23 in Scotland, these influences on overall population structure from migration are smaller than the impact of the baby boom and baby bust cohorts. Based on these trends, the effect of changing age structure is likely to decrease total conviction rates. This is because in 1989 the large baby boom cohorts were in their twenties and thirties – ages typically with higher conviction rates than older ages. As these large cohorts were replaced by smaller baby bust cohorts the effect would be to reduce overall conviction rates, ceteris paribus. As there is less population change for

young people after 2000, change in age structure will have less of an impact on convictions rates during this time. Using standardization and decomposition techniques, the next section formally compares the effects of changing age structure with the influence of prevalence and frequency in reducing total conviction rates.

Standardization and Decomposition of Convicted Offending Rates

Men

Overall results

Comparing 1989 and 2011: men Table 7.1 shows change in conviction rates for men standardized by prevalence and frequency (_beta___gamma_), age-structure and frequency (_alpha___gamma_) and age-structure and prevalence (_alpha___beta_) split into an age component, a prevalence component and a frequency component using the equations described in Section 5.3. In Table 7.1 the standardization column shows total convicted offending rates for 1989 and 2011 standardized by the average prevalence and frequency between 1989 and 2011 (_beta___gamma_), by age-structure and frequency (_alpha___gamma_), and by age-structure and prevalence (_alpha___beta_), as well as the actual (unadjusted) convicted offending rates for 1989 and 2011. The difference between these standardized rates is presented in the decomposition columns. The Difference (Effects) column subtracts the 1989 standardized convicted offending rate from the 2011 rate for to give the impact of age-structure (*alpha*), prevalence (*beta*) and frequency (*gamma*) on change in convicted offending rates between 1989 and 2011). These figures represent differences in overall convicted offending rates per 10,000 attributable to age-structure, prevalence and frequency, and the sum of these effects matches the difference in unadjusted convicted offending rates, confirmed by the bottom row of the table which shows the differences in crude rates with the sum of the contributions from age-structure, prevalence and frequency. If the decomposition has been calculated correctly, these two figures will be equal. The Percentage distribution of effects column shows these different effects as a percentage of overall change in conviction rates between 1989 and 2011. Table 7.1 shows a fall in conviction rates per 10,000 between 1989 and 2011 when standardized by each combination of prevalence, frequency and age-structure. Consequently, each of these three factors has contributed to the decline in overall convicted offending rates. The Decomposition column shows that age-structure contributed a decline of 52 convicted offences per 10,000 people, prevalence a decline of 77 convicted offences and frequency a drop of 15 convicted offences. Prevalence contributed just over half of the total decline in convicted offending rates, age-structure just over one third and frequency around one tenth. However, these effects represent the cumulative impact of these three factors for all age groups, and so do not account for differences in these effects across age. To examine differential effects of age-structure, prevalence and frequency across age, Figure 7.6 plots the age-specific contributions of these factors to the aggregate change in convicted offending rate shown in Table 7.1. Age is shown on the x-axis, with the contribution to the aggregate convicted offending rate on the y-axis. The solid black line shows age, the dashed line shows prevalence and the dotted line shows frequency. Similar to the results seen in Chapter Six, this figure shows a large discrepancy over age in the impact of these three factors on convicted offending rates.

Given the typical shape of the age-crime curve it is unsurprising that most of the impact of change in convicted offending is for those in their teens and early twenties, and Figure 7.6 displays a large impact of declining prevalence of convicted offending for men under the age of 22 leading to lower overall convicted offending rates. Prevalence still acts to reduce overall convicted offending rates up to age 28, although the contribution declines rapidly with age. However, for those aged between 29 and 45 changes in prevalence have contributed modest increases to overall rates of convicted offending. This reflects the change in the age-crime curve described in Chapter Six, with declining prevalence for young men and increases in prevalence for older men. Whilst the magnitude of change is smaller, frequency has also contributed to declines in convicted offending rates until age 27, at which point the impact of frequency is to increase overall convicted offending rates until around age 40. This is in line with the changes in the frequency of convicted offending described in section 7.1. Age structure has a consistent effect in lowering convicted offending rates until age 42, whilst between age 42 and 55 age structure contributes slight increases to overall convicted offending

rates. This is the impact of the ageing baby-boom cohort being replaced by smaller baby-bust cohorts seen in Figure 7.5.

Together the trends shown in Figure 7.6 emphasise that there have been different trends across age in the impact of prevalence, frequency and age-structure. Lower prevalence and frequency for young men, as well as young men making up a smaller proportion of the population, work together to drive down aggregate convicted offending rates. The impact of prevalence, frequency and age structure in reducing conviction rates for young men is sufficiently large to outweigh increases in prevalence and frequency for those from their late twenties to early forties. Figure 7.6 also shows that increases in prevalence and frequency for those age 25-40 are to some extent counteracted by demographic change, with there being a smaller proportion of the population of men aged 25-40 in 2011 compared to 2011. The baby bust both magnified declining convicted offending rates for young men and also suppressed increases in conviction rates for men in their late twenties and thirties.

Comparing 1989 and 2011: women Table 7.2 presents the standardization and decomposition of convicted offending rates by age structure, prevalence and frequency for women between 1989 and 2011. This table is presented in the same format as Table 7.1. As would be anticipated, the convicted offending rates in 1989 and 2011 are much lower for women than men (unadjusted rates of 46.74 and 40.04 for women compared to 376.69 and 231.67 for men). The aggregate decline between 1989 and 2011 is commensurately lower (a drop of 6.70 convictions per 10,000 for women compared to a fall of 145.02 convicted offences for men). Of this overall change, the substantial majority comes from changes in age structure, which provides almost 80% of the overall decline in standardized rates of convicted offending between 1989 and 2011. In contrast, prevalence and frequency each contribute only around 10% of this change. Compared to the results for men, change in the age structure of the population has played a much greater role for women in reducing overall rates of convicted offending between 1989 and 2011. In contrast, changes in the prevalence of convictions much less important for women than men. and emphasise that there are substantial differences between men and women in the impact of prevalence, frequency and age-structure on conviction rates.

Figure 7.7 presents the age-specific contributions of age-structure, prevalence and frequency to the overall change in convicted offending rates for women in Table 7.2. As with men, changes in population structure led to declines in convicted offending rates between the ages of 16 and 38 and much smaller increases in conviction rates between the ages of 38 and 55. Again, this reflects the replacement of the large babyboom cohort with smaller baby bust cohorts. Prevalence contributes to a decline in convictions from ages 16 to 25 to a greater extent than age-structure, but this decline in prevalence for young women is counteracted by increases in prevalence from age 25 to 55, particularly through the late twenties and thirties. For women there is a similar pattern of variation over age in the effects of prevalence as seen for men, with prevalence declining for young women and increasing during the twenties and thirties. Unlike with men, falls in the prevalence of convicted offending for young women do not outweigh these increases in prevalence for older women, leading to the small overall effect of prevalence for women seen in Table 7.2.

There are only small contributions of frequency in reducing standardized convictions rates, predominately for women aged 23 and under. Despite prevalence and frequency having similar contributions to aggregate convicted offending rates, for frequency this is due to very small amounts of change overall, whilst for prevalence this is due to relatively large declines in prevalence for those in the teens and early twenties being counteracted by increases in the prevalence of convicted offending for those in their late-twenties to late-forties. Whilst the net impact of these two factors is similar, for women there is much more variation over age in the impact of prevalence than frequency.

Discussion

The anatomy of the crime drop: Comparison with existing research The results presented so far provide an important insight into change in convictions patterns over the period of the crime drop in Scotland. The results in Tables 7.1 and 7.2 and Figures 7.6 and 7.7 demonstrate that prevalence has played a greater role in leading to declines in convicted offending rather than frequency, although this effect is much more pronounced for men than women in this analysis. There are similarities between these results and those

of Berg et al. (2016), who note the importance of declines in prevalence for violence and both prevalence and frequency for property crimes. However the results here are a helpful complement to those of Berg et al. (2016), adding important nuance to their results. In particular, the results presented so far contribute three important points to the existing literature.

First, the findings presented so far show a marked difference in the role of prevalence and frequency across sex.

link to Sivertsson

This questions whether the findings of Berg et al. (2016), who focus exclusively on a male cohort, are applicable to young women and emphasises the differences in conviction trends across sex described in Chapter Six. Second, these results show contrasting trends over age in prevalence and frequency, with those between the ages of 25 and 40 having very different trends to younger men and women. These discrepancies over age suggest that a focus on analysing change in prevalence and frequency for a small age range – even one which has historically provided a disproportionately large contribution to offending rates – as in Berg et al. (2016) may not tell the full story of how prevalence and frequency have changed over the course of the crime drop. Indeed, the results presented here question the value of providing a singular answer to the question of how prevalence and frequency have changed over the course of the crime drop.

Third, the results presented so far indicate that a full account of the 'anatomy' of the crime drop must include age-structure as well as prevalence and frequency as this factor has also contributed to reductions in conviction rates. Given the data used by Berg et al. (2016)124, it would have been infeasible to include age-structure as part of their analysis. Being able to account for population change is a benefit of using SOI data to explore this problem, and of the research design adopted here. It should be noted that comparing these results with those of Berg et al. (2016) must be done with care as their analysis had different aims from those presented here. Berg et al. (2016) used a regression approach to estimate change in prevalence and frequency between two cohorts and whether that change was statistically significant. In contrast the approach adopted here aimed to separate out the decline in convicted offending rates that has been observed into three distinct components, including prevalence and frequency; even if, as was the case for women, there was little overall change. Moreover, the focus of Berg et al.'s (2016) analysis on self-reported offending is another point of difference with the results presented here. Given that SOI obeys the principal offence rule (Aebi and Linde, 2012) and so multiple offences are covered by single convictions, it is likely that the figures presented here would substantially underestimate the frequency of offending behaviour. Whilst any differences in trends between men and women and across age are not affected by this, and likewise the comparison between age structure and conviction rates, this may explain the greater importance of frequency as seen in Berg et al.'s (2016) results. Berg et al.'s (2016) analysis showed a decrease in property crimes of 47% due to frequency, as opposed to the findings presented here which show that frequency contributed around 10% of overall declines in convicted offending for both men and women.

7.4 Standardization and Decomposition: Comparing 1989-2000, 2000-2007 and 2007-2011 To account for potential differences across time, standardization and decomposition analysis are conducted for the three periods identified in Chapter Six. The table is arranged in the same format as Table 7.1 and 7.2, but divided into vertically into three sections, which present standardization and decomposition analyses for 1989- 2000, 2000-2007 and 2007-2011 respectively. As a result, change over time in the effects of prevalence, frequency and age structure can be seen by making comparisons between these three sections. Men Table 7.3 shows that the effects of prevalence, frequency and age-structure differ substantially over the three periods analysed. Prevalence has played a much greater role in reducing convictions rates than frequency overall, but between 2000 and 2007 the impact of prevalence was to increase standardized rates of convicted offending whilst frequency continued to reduce overall convicted offending rates. Age structure has had a consistent effect in lowering standardized convictions rates for men, but its largest impact was between 1989 and 2000. The results for each of these three periods are discussed in turn. The period between 1989-2000 shows similar patterns to overall change in agestructure, prevalence and frequency. Each of these three components led to declines in the overall conviction rate, with prevalence showing the largest impact (around 56%) followed by age-structure (42%), with frequency contributing a very small amount of change (2%). Of the three

periods, 1989-2000 showed the largest change in the overall conviction rate for men, with a decline of just fewer than 119 convicted offences per 10,000 population. It is worth noting though that this period also covers the longest time span, which provides more opportunity for convicted offending rates to change. In marked contrast, from 2000 to 2007 there are overall increases in the rate of convicted offending by around 17 convicted offences per 10,000 people. During this period the effect of prevalence and the effects of age-structure and frequency pull in opposite directions, with age-structure and frequency both lowering overall rates of

convicted offending, whilst prevalence acts to increase total convicted offending rates. As a result, the effect of prevalence contributes more than 200% of the increase in total convicted offending rates. Not only are increases in convictions exclusively due to prevalence, the convicted offending rate during this period would be twice as large as that which was actually observed if age-structure and frequency had not served to counteract increases in prevalence. In the final period from 2007-2011, age-structure, prevalence and frequency all contribute to declines in the total rate of convicted offending, as in the period 1989- 2000. However, unlike in this first period the substantial majority – almost 90% – of this decline comes from changes in prevalence. Age-structure contributes just over 8% to this decrease, with frequency providing a decline in total convicted offending rates of just over 2%. Whilst age-structure contributed over 40% of the drop in convicted offending rates between 1989 and 2000, its contribution between 2007 and 2011 is just over 8%. This shorter period also help to explain the lesser contribution of age-structure to convicted offending rates during these periods, which are gradual (Zimring 2007) and so have less opportunity to show substantial change across shorter time periods. It should also be noted that whilst the overall amount of change in this period is smaller than between 1989-2000, showing a decline of 43 convicted offences per 10,000 people, this period is also much shorter (four years compared to eleven years). As such, the average rate of change between the two periods is similar (an average decline of 10.80 convicted offences per year between 1989 and 2000 compared to an average decline of 10.77 convicted offences per year between 2007 and 2011). Table 7.3, then, shows very different trends in each of the three periods analysed, which are obscured by only examining aggregate change between 1989 and 2011. As with Tables 7.1 and 7.2, figures in Table 7.3 represent population totals. Figure 7.8 presents the age-specific contributions to the standardization and decomposition analysis discussed in Table 7.3. The top-left panel is a replication of Figure 7.6, which shows the age-specific contribution to the decomposition between and 1989- 2011. The top-right panel shows the standardization and decomposition between 1989 and 2000, the bottom-left panel that for 2000-2007 and the bottom-right panel the results for 2007-2011. Including the results for 1989-2011 alongside the analyses for different periods helps to compare the change within each of the three periods to the overall pattern of change between 1989 and 2011. Unsurprisingly, Figure 7.8 shows that the majority of the contribution of agestructure occurred between the ages of 16 and 30 from 1989 to 2000, as the baby boom cohort was replaced by smaller baby bust cohorts. As expected from Chapter Six, this period also shows declining prevalence of convicted offending rates for men under age 30, with no increases in prevalence for older ages. Frequency shows a very small impact in reducing convicted offences for men under the age of 20 between 1989 and 2000, and some slight increases for those in their mid-twenties, but little overall change. The second period from 2000 to 2007 presents a very different picture. The increases in prevalence for those between their mid-twenties and forties seen in Chapter Six occur entirely between 2000 and 2007, and these ages contribute to increases in overall convicted offending rates. In contrast, the frequency of conviction decreases during this period for those aged under 25, and this is also the period with the greatest decrease in convicted offending rates due to age structure between 27 and 40, as the smaller baby-bust cohorts move through these ages. Between 2007 and 2011 we see a similar magnitude of declines in prevalence for young men as between 1989-2000. However, there is little change in frequency during this period, and there is almost no effect of population structure reducing conviction rates for young men. Instead, during this period the baby-bust cohorts are between their early thirties and mid-forties. Whilst changes in age-structure due to the replacement of baby boom cohort with baby bust cohorts does contribute to lower convicted offending rates, this effect is much smaller than the effect of the same baby bust cohorts replacing the baby boom cohorts in the 1990s, due to the lower prevalence of conviction for men in their thirties compared to men in their twenties. The results presented in Figure 7.8 show very different trends in the relationship between prevalence, frequency and age-structure for men of different ages in different periods. Of these three factors, prevalence has had the greatest effect in

both decreasing and increasing conviction rates across all three periods. The effects of age-structure are concentrated between 1989-2000 as baby boom cohorts in their early twenties were replaced by baby bust cohorts. The effect of frequency was consistently much smaller than that of prevalence over all three periods. Women Table 7.4 presents the standardization and decomposition results for women between 1989-2000, 2000-2007 and 2007-2011 in the same format as Table 7.3. Again, this analysis shows very different trends in the impact of prevalence, frequency and age-structure in different periods. As with men, the first period (1989-2000) shows very similar results to those presented in Table 7.2 for the whole of the SOI (1989-2011). During this time the convicted offending rate fell by just over six convicted offences per 10,000 people, with almost 80% of this decline being attributable to change in age-structure. Prevalence and frequency both also show declines over this period, contributing just over 8% and 12% of change respectively. In contrast, and as with men, the period 2000-2007 had an average increase in total rate of convicted offending by 7.9 convicted offences per 10,000. In fact, the convicted offending rate in 2000 was higher than it was 1989. This change is entirely attributable to increases in the prevalence of conviction, which contributed an increase of 9.5 convicted offences per 10,000 population. Whilst prevalence served to increase convicted offending rates, age-structure and frequency both decreased convicted offending during this period by 1.22 and 0.42 convicted offences per 10,000 respectively. As with men, the effects of prevalence pulled in the opposite direction to the effects of age-structure and frequency during this period. In the final period between 2007 and 2011 the total rate of convicted offending shows the greatest amount of change for any of the three periods, falling by 8.49 convicted offences per 10,000. This drop is overwhelmingly due to falls in the prevalence of convicted offending, with age-structure also providing small declines in the total convicted offending rate during this period. In contrast, frequency led to an increase in convicted offending between 2007 and 2011 of 0.76 convicted offences These results show that change in age structure has consistently led to lower rates of convicted offending for women, but the impact of prevalence has been much more varied. Prevalence playing little role in reducing convicted offending rates for women between 1989 and 2000, contributed a large increase to overall convicted offending rates between 2000 and 2007 and then provided an almost equivalent decrease in convicted offending rates from 2007 to 2011. As with men, frequency had the smallest impact of the three factors analysed. Figure 7.9 shows the age-specific contributions of age structure, prevalence and frequency to the overall convicted offending rate for women in the same format as Figure 7.7. As seen in Figure 7.8, Figure 7.9 shows substantial differences between the different periods analysed in the contributions of demographic change, prevalence and frequency across age. During the period 1989-2000 there was little systematic contribution to standardized conviction rates from change in age-specific rates of prevalence or frequency. In contrast, age-structure led to declining convictions between ages 16 to 30 due to there being fewer young people in the population, and also increases in conviction rates due to there being a larger proportion of women in their thirties between 1989 and 2000. As the baby-bust cohorts aged, there were falls in conviction rates for women aged 26 to 40 between 2000 to 2007. This period also shows prevalence increasing conviction rates between the ages of 23 and 45, with the majority of the overall increase in prevalence for those aged 23 to 45 between 1989 and 2011 (Figure 7.7) coming in this period. In contrast, there is very little change in prevalence for women age 17 to 22 during this period. As with men, the impact of these changes in prevalence are to some extent suppressed by change in population structure, with this period of higher convicted offending rates spanning the cohorts of the baby bust, but increases in prevalence are also seen for the cohorts of the baby boom and cohorts of slightly larger size which followed the baby bust (see Figure 7.3). During this period frequency of convicted offending drops between ages 17 and 22, but shows little change across the rest of the age-distribution. Finally, the period between 2007 and 2011 shows sharp declines in prevalence between age 16 and 28, especially for those aged 20 and under, and small declines between age 40 and 45. This period shows almost the entirety of the decline in prevalence for young women seen between 1989 and 2011, as can be seen by the similar magnitude of negative contribution to overall convicted offending rates for women under age 23 in the 1989-2011 and 2007-2011 panels. Age structure has much less impact in this period, with the exception of small declines due to the baby bust cohorts who were in their mid-thirties during this period. The small increases due to frequency during this period predominately occur between age 25 to 30 and 34 to 38, with little clear pattern. These results show substantial variation over time in the impact that prevalence, frequency and age-structure have had in reducing and increasing conviction rates for women. To help make comparisons between men and women more explicit, the following section compares the relative contribution of these three factors for men and women. Comparison of trends between men and women The results presented so far have shown complex patterns of change over time in

the contributions of age-structure, prevalence and frequency to falling aggregate conviction rates for men and women. Given the substantial difference in rates of convicted offending between men and women these results can be difficult to directly compare across sex. To make more obvious differences in trends between men and women, Table 7.5 shows change attributable to age-structure, prevalence and frequency for men and women as a percentage of the 1989 convicted offending rates for men and women respectively. Comparing the contributions of these three factors between men and women over time shows similar directions of effects but with differences in magnitude of the effect of prevalence. From 1989 to 2000 prevalence played a much larger role in decreasing the convicted offending rate for men than it did for women (17.66% compared to 1.11%). Between 2000 and 2007, prevalence increased for men and women, but the relative contribution of prevalence for women was more than twice as large as that for men (20.41% compared to 9.07%). In the final period prevalence led to falls in the total convicted offending rate for both men and women, but with the effect for women being more than to 80% larger than that for men (18.83% compared to 10.27%). With the exception of the period between 2007 and 2011, women consistently show lower declines and greater increases in the rate of convicted offending than men, and in particular due to prevalence. These different trends for men and women emphasise the point made in Chapter Six that conceptualizing the crime drop as a homogeneous process may provide too simple

Discussion ... again?

> _ We have increased our understanding of the crime drop with these techniques. THey give a new answer to the question of whether the crime drop is due to prevalence or frequency: it depends! _

For both men and women change in age structure led to lower conviction rates for both sexes between 1989 and 2011, and particularly through the 1990s. For young men, the 1990s was also a period of declining prevalence. From 2000-2007, when the prevalence of convicted offending increased for men and women in their mid-twenties to early forties, change in both age structure and the frequency of convicted offending served to mediate these increases on overall convictions rates. In contrast to the crime drop through the 1990s, between 2007 and 2011 both men and women show declines in standardized convictions rates primarily due to declining prevalence of convictions, with only small contributions from changes in age structure. These results have a number of implications for our understanding of change across the different dimensions of criminal careers, and for the study of the impact of demographic change on crime rates. First, the results of this chapter are in agreement with the finding of Chapter Six that increases in the prevalence of conviction between 2000 and 2007 are best explained by a process of net-widening. The results presented in this chapter have show that increases in prevalence are accompanied by aggregate declines in frequency between 2000 and 2007. As discussed in Chapter Three, this is what would be expected by an influx of people with low numbers of convictions. This dovetails with the findings of Chapter Six that increases in prevalence during this period are best explained by a period effect, and hence system, effect. That these effects are experienced by women to a greater magnitude than men also fits with Estrada et al.'s (2015) suggestion that women are likely to be disproportionately affected by net-widening.

This analysis has also presented three methodological advances over the existing uses of standardization and decomposition analysis to examine the impact of demographic change on crime rates. In examining the impacts of prevalence and frequency as distinct, the analysis presented here provides an advance on previous decomposition analyses of the contributions of population change to the crime drop, such as that of Levitt (1999). Calculating standardized rates using methods using three factors allowed this analysis to separate out the effects of prevalence and frequency. The differing trends displayed by prevalence and frequency in this analysis would have been conflated in a two-factor standardization. Whilst the capacity to include these three factors is dependent upon suitable data being available, these results suggest that future standardization and decomposition analysis using convictions data should consider these factors as distinct if possible. If this is not possible, results should be understood as primarily representing prevalence. In addition to the benefits of conducting standardization and decomposition with three factors, this analysis has demonstrated the value of calculating multiple standardization and decomposition analyses across different time periods,

informed by a descriptive understanding of trends in the data. Comparing results of different periods with those for 1989 to 2011 as a whole, this analysis has shown that the effect of age-structure, prevalence and frequency is very unevenly distributed across across time. However, the different trends across periods seen in the standardization and decomposition here are obscured when only examining the start and the end of SOI. Future decomposition analysis of the impact of age-structure on crime rates should be informed by preliminary inspection of the data to identify potential turning points or non-linear trends which must be accounted for during analysis. Similarly, presenting the contributions of different ages to the standardization and decomposition analysis illustrated that change across these three factors was unevenly distributed over age, with young people showing different trends to those from their mid-twenties to early forties. These differences are obscured by aggregate analysis, and again future standardization and decomposition analysis would benefit from investigating the different contributions of different ages to overall trends to identify where in the age-spectrum change has occurred.

an account of different patterns of change across both sex and age.

Conclusion

The results show that between 1989 and 2011 the prevalence of convictions was the most important factor influencing conviction rates for men, whilst age structure was the most important influence on convictions rates for women. However, the different periods identified in Chapter Six (1989 to 2000, 2000 to 2007 and 2007 to 2011) show very different relationships between prevalence, frequency and age structure. Changes in age-structure in the population led to falling convictions rates for men and women through the 1990s. This combined with falling prevalence of conviction for men during this period, but not for women. In contrast, in the early to mid- 2000s prevalence increased for both men and women, but the effects of increasing prevalence were tempered by age-structure serving to reduce convictions during this period. The final period of crime drop from 2007-2011 is almost exclusively due to falls in prevalence, with little impact of age-structure, and unlike between 1989 and 2000 this is seen for both men and women. Frequency had only a marginal effect on conviction rates in any period.

compare with Sivertsson here

Original contribution

Substantively, the finding of differential effects of age-structure, prevalence and frequency for men and women of different ages suggests that the results of the previous analysis of change in prevalence and frequency over the course of the crime drop in the 1990s (Berg et al. 2016) may not be generalizable beyond the narrow range of men aged 17-18 covered in Berg et al.'s (2016) study. These discrepancies across age, sex and period emphasise the value of using the breadth of data afforded by using an administrative dataset to complement analysis using self-report studies with a more limited demographic scope.

Prevalence and the impact of formal sanctioning mechanisms on offending

Link to Andersen

On balance, the results of this analysis suggest that policing and imprisonment practices have not played an important role in reducing conviction rates in Scotland by reducing offending. This conclusion is primarily based on the assertion of Blumstein et al. (1988a) and Berg et al. (2016, citing MacLeod et al. 2012), falls in prevalence and not frequency imply that the mechanism leading to falling crime rates is a general one, and not one targeted at high rate offenders. Results presented in Chapters Seven and Eight both suggest that prevalence has played a lesser role in reducing convictions than has frequency. It should be noted that a smaller impact of frequency of conviction as opposed to prevalence in SOI will be to some extent

influenced by convictions data underestimating the frequency of offending (Aebi and Linde 2012). Indeed, Berg et al.'s (2016) analysis of changing prevalence and frequency showed a greater effect of falling frequency of conviction than that presented here. Together, these results suggests that 'tertiary mechanisms' of crime prevention, such as those through courts and policing are unlikely to have a played a role in reducing the volume of convictions in Scotland. Given that this analysis is not a direct assessment of the impact of policing strategies or imprisonment rates, this can only be considered tentative support for the idea that these factors have not influenced the crime drop in Scotland. However, this observation is in agreement with the wider literature (Tonry, 2014; Farrell et al. 2014) which suggest that changes in national justice policies and trends in imprisonment are unlikely to have played a role in reducing crime rates internationally, due to the country-specific quality of such factors and the international nature of the crime drop. Together, these factors suggest policing and imprisonment are unlikely to have played a significant role in reducing conviction rates in Scotland.

Whilst the finding of sex differences in conviction patterns is not new to criminal careers research, the differences in convictions trends for men and women observed in this thesis are important for the study of recent change in criminal careers. These findings suggest that generalizing from male-only studies, such as Berg et al. (2016) may misrepresent change in women's criminal careers over the course of the crime drop. The results presented here also add nuance to the findings of those who have emphasised that declines in offending over the crime drop have been disproportionately experienced by men (Lauritsen et al. 2009; Von Hofer, 2014 and Backman et al., 2014). The discrepancy in convictions patterns between older and younger men and women suggests that to analyse changes in the gender gap without accounting for age, and vice versa, can give only a partial picture of change in aggregate crime rates.