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Reform of Police Pensions in England and Wales

by

Rowena Crawford* and Richard Disney†

Abstract

We analyse pension reforms for police officers in England and Wales using force-level data. We quantify the impact on overall police pension plan liabilities, examining incidence across police officers, national and local taxpayers. We also examine reforms of retirement rules, especially concerning early retirement on grounds of ill-health. Differences in ill-health retirement across forces are statistically related to area-specific stresses of policing and force-specific human resources policies. Reforms in 2006 impacted primarily on the level of ill-health retirement among forces with above-average rates of early retirement. We find residual differences in post-2006 ill-health retirement rates across forces are related to differential capacities to raise revenue from local property taxes.

JEL Classifications: H75, J26, J45

Key words: Police pensions Ill-health retirement State and local finance

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Reform of Police Pensions in England and Wales

1. Introduction

This paper considers recent reforms to the pension arrangements of police in England and Wales. It calculates the effect of these reforms, both immediately and in ‘steady state’, on police pension plan liabilities, constructing a simulation model of the pension plan and changing model parameters to reflect the various reforms. It examines the incidence of the reduction in pension liabilities between taxpayers and police officers. It then utilises econometric methods to examine one specific component of the reforms: the change in the procedures for and finance of early retirement on grounds of ill-health, and analyses the incidence of this reform between national and local taxpayers as well as police officers themselves. Given that there has been very little academic research into public pension plans in the United Kingdom and no research, to our knowledge, into police pensions or police labour markets in particular, these are new contributions to the literature.

Unlike the United States, most public sector pension plans in the United Kingdom (UK) are unfunded and operate explicitly on a pay-as-you-go (PAYG) basis.¹ The UK’s police pension plan is no exception. The combined projected pension liabilities of these UK public sector plans was calculated in 2010-11 to be £959.5 billion² (of which only £66.2 billion was funded) with the projected unfunded liabilities of the police pension plan alone estimated at £93.8 billion, or around 10% of the total. Efforts to curtail public pension liabilities in recent years have involved raising normal pension ages, reducing accrual rates, changing indexation provisions and reducing rates of early retirement on grounds of ill-health. All these reform methods have been applied to police pensions. It is however important to note at this point that only the reform of early retirement provisions described here has an immediate impact on police pension liabilities; thus there are questions both of intergenerational incidence as well as incidence across interest groups.

Another important feature of public pension plans in the United Kingdom (UK) – again in contrast to the United States – is that public sector plans in the UK are broadly nationwide plans, with common normal pension ages, accrual rates etc across local jurisdictions. Nevertheless, although pay and pensions are set nationally, many public sector workers are

¹ That is, there has been no deliberate policy of attempting to pre-fund these plans. The most significant exception, in terms of size of plan, is the Local Government Pension Scheme which is notionally fully-funded but is in practice somewhat under-funded.

² In US dollars, this is a total liability of around 1.6 trillion. See HM Treasury (2011b).

employed and managed by local authorities; hence many pension plans – those for police, local government employees, teachers and firefighters – are administered and managed at the local level.³ Until recently, these local authorities had considerable discretion in workforce practices, including how they managed early retirement on grounds of ill-health. So in the case of the police, whilst there is a fixed nationwide normal age at which police can first retire, local discretion has allowed rates of early retirement on grounds of ill-health to vary widely across jurisdictions (there was no other ‘avenue’ to early retirement in the police pension plan in the period under consideration). This local discretion raises a tension as to ‘who pays’ for early retirement, which can be summarised as follows.

Local police services, in common with local government and fire services, are financed by a mixture of central government grant allocations and local taxes levied on domestic properties within local jurisdictions. In the case of the police: until 2006, pension payments to police officers, whether they had retired under normal arrangements or through ill-health retirement, were wholly financed by employee contributions (set at a common national rate) and by central government grant allocations. Because local authorities had discretion, within broad government guidelines, as to how they managed ill-health retirement in this period, they had an incentive within the financing mechanism to utilise ill-health retirement as a vehicle for removing lower quality officers (for example, those with lower fitness or general aptitude and commitment) from their workforce, wholly at the expense of national government.

This diffusion of costs across jurisdictions led to high rates of ill-health retirement of police officers in general, coupled with widespread variations in rates across police forces. For police officers, the incentive to utilise ill-health retirement as a workforce management tool was exacerbated by the unique peculiarity of the police officer’s terms of employment, under which a police officer cannot be made redundant before the first age at which he or she

³ The term ‘nationwide’ in the United Kingdom takes account of the distinct arrangements for the four nations of the UK: England, Wales, Scotland and Northern Ireland. ‘Local’ jurisdictions in the UK are counties or large metropolitan areas such as Greater London and Merseyside. In what follows, we compare the ‘national’ level (of England and Wales, which have identical arrangements) with the ‘local’ level of counties or large metropolitan areas i.e. the second and third tiers of the UK’s jurisdictional disaggregation. Our discussion of ‘national’ v ‘county or metropolitan area’ in the UK parallels to a great extent the US’s distinction between ‘state level’ and ‘county or city level’ jurisdictions.

could normally retire (i.e. age 50).⁴ The discrepancy between the incidence of perceived local benefits and national costs arising from discretionary retirement was noted by central government and in 2006, among the reforms to the police pension plan, a cost-sharing policy was introduced by which part of the cost of ill-health retirement would be borne by the local employer and indirectly, therefore, by the local taxpayer. The implications of this specific policy change are discussed later in the paper.

The paper is therefore structured as follows. The next section provides a brief background on institutions, and on pension and retirement policies in the police service, including ill-health retirement. It then examines the effect of the various reforms on overall liabilities of the police pension plan. To do this, a simulation model of the police pension plan as it existed prior to 2006 is constructed for a representative cohort of police officers, benchmarked on parameters obtained from a variety of official sources, on which we simulate the various reforms. The model is described briefly in the text; a fuller description can be obtained from the authors on request.

Section 3 shows that the overall package of reforms introduced in 2006 will, in steady-state, reduce discounted pension liabilities of the police pension plan by around 23%, with the bulk of the incidence of this reduction born by police officers; national government (and future national taxpayers) are thereby beneficiaries. We provide tentative evidence of the effect of the even more substantial reform to police pensions which is planned to be introduced in 2015, generating not only larger gains to national taxpayers but also within a shorter time span.

Section 4 focuses on the ill-health retirement component of the 2006 reform. We show that it accounts for a very small fraction of this reduction in long-term liabilities. We estimate that the reform increases the average working tenure (reduced the length of retirement) by around half a year largely bringing high ill-health retirement rates in a minority of forces into line with the average.⁵ However, given the very gradual transition to the other new features of the police pension plan, only these changes to ill-health retirement provisions have any immediate impact on pension liabilities.

⁴ It should be noted, however, that high rates of ill-health retirement we also observed in the late 1990s among other groups such as firefighters and ambulance crews even though such workforces had conventional employment contracts: see HM Treasury (2000) Table 2.

⁵ A considerably greater increase in working tenure (reduction in retirement tenure) is involved, of course, for those who would have taken ill-health retirement.

Finally, we take account of the cost-sharing component of the ill-health retirement reform. The effect of the reform on early retirement rates will be ameliorated to the extent that local police authorities can increase local taxes to offset the reduction in central government support for ill-health retirements. Using econometric methods, we show that the tax-raising capacity of local police authorities varies widely, and that controlling for variations in the elasticity of tax revenues to property tax rates, local taxes are higher in jurisdictions where ill-health retirement rates are higher under the post-2006 cost-sharing regime. The incidence of this component of the reform is therefore more complicated than other components: there is a small shift of costs from national government (taxpayers) to police officers through the reduction in early retirement in some police forces, but a more significant potential long-run shift from national taxpayers to local taxpayers through the introduction of a cost-sharing mechanism for ill-health retirement.

2. Background

2.1 Institutions

All policing in England and Wales is carried out at the local level by 43 territorial police forces. Forces are normally organised at the county level, albeit with some county forces merged into larger ‘territorial areas’ (e.g. ‘Thames Valley’) or ‘joint forces’ covering larger municipal areas such as Greater Manchester and, for most of London, the Metropolitan Police. A typical police force in England and Wales covers a population of around 1 million people, although the joint forces typically cover larger populations and, in the case of the Metropolitan Police, over 10 million people.⁶

Despite the decentralised territorial nature of policing in England and Wales, all police officers, irrespective of rank, are appointed to the national ‘Office of Constable’ – a procedure dating back to the year 1066 (but more mundanely enshrined in the Police Acts of 1964 and 1996) – by which an officer is sworn into the office by their local police force and thereby gains powers of search and arrest that are not available to the general public including, under certain conditions, the power to arrest outside their own territorial area. Police officers therefore do not have an ‘employment contract’ with an individual police force, and thereby lack certain standard employment ‘rights’ such as the right to form a trade

⁶ ‘Nationwide’ police activities, such as homeland security, serious crime, fraud etc. are devolved to specialised units in some of these forces, notably the Metropolitan Police. As is apparent a ‘county’ in England and Wales is typically a larger territorial jurisdiction in terms of population than a county in the United States.

union and take industrial action. Equally, except under certain very specific conditions, a police officer cannot be made redundant, and will continue in the ‘office of constable’ (irrespective of actual rank) until he or she cannot undertake the full variety of tasks – both physical and mental – required by their office. For that reason, the age of ‘normal’ retirement for a police officer has traditionally been set at a relatively young age – either on attaining age 50 or after 30 years of service.

2.2 Pay and pensions

In contrast also to the United States, the determination of police remuneration in the UK has become increasingly centralised over time. At the turn of the twentieth century – when there were many more local police forces in the UK – pay was set locally. However in 1918 a 50% central exchequer grant was introduced to supplement finance of police forces from local property taxes, and local police authorities were required to place their police forces on one of two pay scales which were subsequently broadly consolidated into a single scale in 1962 (albeit with additional allowances especially within the (London) Metropolitan Police). Police pay (and increases thereof) is now set through a national statutory negotiating framework for changes to pay and conditions. Proposed reforms to police pay and conditions (such as Winsor, 2011, 2012), are also dealt with through this negotiating machinery.⁷

Pension provisions of the police are as follows. Most current police officers – both active and retired – are members of the Police Pension Scheme (PPS), which is a national unfunded contributory final salary defined benefit pension plan dating from 1987, although key principles of the scheme date back to 1921 and to subsequent legislation. Since April 2006, this scheme has been closed to new members, and new entrants to the police force are offered membership of the New Police Pension Scheme (NPPS), introduced as part of the reform process to public pensions initiated in the early 2000s (see Pensions Policy Institute, 2008).

More recent changes in police pension arrangements should also be noted. First, in line with changes to all public sector pension plans proposed by HM Treasury (2011a), the government has raised employee contributions to both the PPS and the NPPS and changed the method of indexation of pensions in payment. Second, proposals stemming from both HM Treasury (2011a) and Winsor (2012) have led to a major police pension reform announced in late 2012 to be implemented in 2015. This reform will raise normal pension age

⁷ There are recent moves away from the long process of centralisation of police finances and remuneration in England and Wales: for example, newly elected police commissioners from November 2012 have been given greater discretion over how police budgets are allocated across tasks.

to 60 for serving police officers in 2015 and also shift the pension calculation to a revalued career-average rather than final salary basis. These changes will take place immediately for all new accruals by serving police officers bar those within a 10 year ‘window’ of the normal pension age; however accrued rights are retained under the old formulae. This is in contrast to the NPPS reform, which only applied to new entrants to the police service. The main characteristics of the PPS, NPPS and the 2012 reform framework, are summarised in Table 1.

Finally, it should be noted that the average age at which police officers enter the service has tended to rise over the last few years, not least because of the excess supply of applicants and potential recruits. This has allowed forces to recruit candidates with greater experience (including experience in police staff roles) and enhanced educational qualifications. According to the NPIA (2010), the average age of successful police applicants at national assessment was almost 27 years; long gone are the days when a new entrant to the police service had left school at age 18, or even earlier.

2.3 Management of police retirement

As shown in Table 1, normal retirement for police officers entering the police service before 2006 can currently take place after 30 years service or at age 50, with a retirement pension of up to two thirds of final salary. Both the 2006 reform (for new entrants) and the proposed 2015 reform (for all officers who are more than 10 years away from their existing date of normal retirement) increase these normal pension ages, although they are still below those in most other public sector pension plans.

Although the existing terms are generally regarded as among the most generous on offer in public sector pension plans, especially in terms of normal retirement date,⁸ police forces have also been characterised by high levels of *early* retirement on grounds of ill-health, especially in the late 1990s when medical retirements were averaging almost half of all retirement across police forces (HM Treasury, 2000).⁹ Ill-health retirement rates across forces varied from less than 20% of all retirements to over 75% in the same period; the high rates being seen as arising from a combination of generous enhancement provisions (*ibid*,

⁸ Even allowing for the higher contribution rate levied on police officers than in other public pension plans: see Pensions Policy Institute (2008). Nor is there evidence of lower life expectancy among police officers than the general population as a justification for lower pension age: see Government Actuary’s Department (2011).

⁹ By way of comparison, average medical retirement rates in the same period among firefighters were 68%, among teachers, 25%, and in the armed forces 6%. Private sector rates (for those companies with pension plans with similar provisions) typically averaged around 10%. See HM Treasury (2000), Table 2 and Figure 3.

Tables 1 and 2) and weak enforcement and monitoring of medical claims by individual police forces (Poole, 1997). Ill-health retirement rates have fallen since that time, partly due to tighter monitoring and to an increased willingness of forces to place officers on ‘restricted duties’.¹⁰ There is no continuous time series available for the period from the late 1990s through to the present but, as a benchmark, the average annual ill-health retirement rate of officers in the late 1990s was around 12 per 1000 (HM Treasury, 2000), being halved by the early 2000s to around 6 per 1000 and falling again to around 2 per 1000 by the end of the period under consideration here.

There are two incentives for police officers to retire on grounds of ill-health, subject of course to the loss of welfare associated with the ill-health itself. First, officers can receive a pension before their normal date of retirement (30 years’ service or the earliest pension age); second, because the ill-health pension is normally enhanced by notional additional years of service. The conditions that determine ill-health retirement for officers are underpinned by police regulations. An individual may be required to retire on medical grounds if he or she is permanently disabled; for police officers this is defined as:

“disabled from performing the normal duties of a police officer, including operational duties, until compulsory retirement age...”

The criterion for ill-health retirement among police officers therefore stresses the officer’s inability to perform ‘operational duties’ – that is, limits on his or her potential full deployability such as in major public order situations and other physically and mentally stressful situations. This is a weaker criterion of ‘disability’ than in most public social insurance settings where ‘disability’ would be defined by reference to incapacity in *any* employment or to a specific set of disabling health conditions. In the context of police officers, this definition relating to ‘full deployability’ links back to the supposed omniscience associated with the ‘Office of Constable’. Consequently, many police officers who were unable to fulfil *specific* duties obtained full ill-health retirement even though they were perfectly capable of engaging in restricted activities.

Historically, as noted by Poole (1997) and others, assessment procedures for ill-health retirement differed widely across police forces. In some cases, ill-health assessments would

¹⁰ Officers on ‘restricted duties’ are constrained in the operational duties that they can undertake: see Winsor (2011) pp.201ff. There is no reduction in pay from being on ‘restricted duties’: Winsor (2012), Chapter 5, recommended that such officers should receive a pay reduction equivalent to the ‘premium’ in police officer pay arising from capability of full deployability.

be made on an initial recommendation from a local line manager and/or evidence from the applicant's doctor coupled with an in-house medical assessment, through to a much more stringent procedure based on several external medical assessments and more detailed consideration of alternative employment in the police service. Moreover, as noted by HM Treasury (2000), the police formula for ill-health retirement pension awards provides enhancement of years of service according to a non-linear formula depending on existing numbers of years' service. There are distinct 'spikes' in awards at those years of service at which the rate of enhancement increases, such as after 10 and 13 years' service. This suggests that financial incentives, as well as medical issues, played a major part in the process. Consequently, after the mid-2000s, efforts were made to implement standardised 'best practice' medical assessment procedures across forces.

2.4 The 2006 reforms to police retirement

As noted in Table 1, in 2006 new entrants among police officers were enrolled in the New Police Pension Scheme (NPPS). In respect of conditions of service, there was one important result of the reform: the NPPS distinguishes officers who are incapable of employment in general from those capable of regular employment elsewhere. In the 2006 scheme, the latter receive only an unenhanced pension. This change makes a sizeable difference to pension payouts in simulated cases (Winsor, 2012, pp. 281-2); however most serving police officers are still covered by the earlier pension scheme which makes no such distinction.

In addition to this change in incentives, Home Office (2005) set a new current target maximum level of ill-health retirements of 6.5 per 1000 officers in service for every police force. Although there were no *direct* financial penalties as such for failing to achieve this target, each police force as a whole received a series of performance targets, of which this was one, and failure to achieve these targets could invite pressure from central government and local police authorities on senior police officers, particularly Chief Constables, who are often appointed on limited tenures, to match up or leave. Finally, a new cost-sharing arrangement was introduced, which is discussed further in Section 4. Combining these changes, therefore, it can be seen that central government, in the form of the Home Office, significantly altered the incentives to local police forces in relation to ill-health retirement.

3. Impact of pension reform on pension liabilities

We investigate the impact of these various reforms on overall (gross) police pension liabilities, and the incidence among various interest groups. Unfortunately, no existing

sources provide comprehensive estimates of the effects of these changes and we have therefore constructed a simulation model of the police pension plan to obtain some magnitudes for the various components of the reform package.

Our simulation model is a representative agent model. The agent joins the police force in the first period with certain demographic characteristics (age and sex). Each subsequent year is then modelled in turn, with the agent able to take one of 5 possible states: working in the police force, withdrawn from the police force with retained rights in the police pension scheme, retired from the police force and drawing a pension, retired from the police force on ill-health grounds and drawing a (potentially enhanced) pension, or dead.

The transitions between these states are governed by assumed probabilities, which are derived from various sources but primarily Government Actuary's Department (2009), which is in turn based on detailed membership data of the PPS as at March 2003 which are not publically available. Earnings progression over the lifetime depends on pay scales, probability of promotion, and assumed real earnings growth derived from external pay uplifts. The pay scales are derived from Winsor (2011); the promotion probabilities are calculated by the authors such as to give a distribution of ranks consistent with Home Office data and with promotion procedures as described in Winsor (2011); the real pay uplift is assumed to be 2% per annum.

There are two aspects to the retirement modelling in the simulation. First, 'normal' retirement allows the individual to retire either at the first age permitted (e.g. age 50 in the Police Pension Scheme) or when the individual has acquired a certain number of years' contributions (see Table 1). We assume a plausible allocation of retirees between these exit strategies in the PPS. Second, we simulate ill-health retirement using the distribution of ill-health retirement rates by tenure, obtained from HM Treasury (2000) Chart 2. We simply assume that changing levels of ill-health retirement rates over time and across police forces involve scaling these tenure distributions of retirement rates proportionally. To compute the enhancement of pension benefits arising from early ill-health retirement we apply the non-linear enhancement rules described in HM Treasury (2000), Table 1.

The final step is to compute the overall liability to the police pension plan. For the representative agent, this is calculated as the sum of the stream of pension income that an individual receives in retirement, discounted back to the year at which the individual joins the force at a real rate of 2% per annum. This gives the gross pension liability per individual. We

then estimate the sum of employee contributions based on the contribution rate specific to each pension scheme and deduct this from the gross stream. This gives the net liability to the government (taxpayer) per individual. These are predominantly national taxpayers given the current financing of the pension plans, but we discuss the implications of the cost-sharing reform introduced for new ill-health retirements after 2006 in the next section.

The model is simulated 10,000 times to compute an average discounted pension liability arising from a representative agent given the assumptions of the model. The distribution of demographic characteristics on enlisting is weighted to reflect the profile of entrants to the police force described in Government Actuary's Department (2009). The entry rate is weighted such that a steady state police force of 120,000 is obtained; this has the interesting feature that an indirect cost of early retirement is that more officers have to be hired (and, of course, accrue pension entitlements) where there are provisions to retire earlier within the pension plan. This computation is then done for alternative average rates of ill-health retirement, to capture the different average levels of retirement prevailing in the late 1990s, the early 2000s and after the 2006 reform, and then for the changes to the other parameters of the pension plan arising from the introduction of the New Police Pension Scheme in 2006 and the new framework as proposed in Table 1. All the assumptions, methods, data and sensitivity analyses underlying this simulation are available on request from the authors.

3.4 Impact on pension liabilities: the results

Table 2 describes the key results of the simulation model. The first column simulates the Police Pension Scheme without any ill-health retirement, computing the total liability of this cohort and the number of entrants needed to generate a steady-state police force of 120,000. The total liability is not easy to compare with the projected liabilities described in the Introduction to this paper, because the latter is the sum of projected rights of a snapshot of employees, retired pensioners and deferred rights at a point in time; we have no way of knowing, for example, whether and how ill-health retirement is built into that aggregate figure. Nevertheless, it can be seen that if the discounted rights of one cohort or 'generation' of police officers total around £2.2 billion, then the aggregate liability will depend on the number of cohorts alive at any one time and the stage of the life-cycle at which they observed.

Table 3 then shows that an ill-health retirement rate of 12 per 1000 officers – the rate prevailing in the late 1990s – using the tenure incidence of ill-health retirement of HM Treasury (2000), increases the discounted pension liabilities by 5%; for this single cohort, by

around £100 million. It also increases the average tenure of retirement (reduces the tenure of employment as a police officer) by around one and a half years. This does not simply arise from the shorter employment histories impacting on pension costs for a given individual, but because more police officers need to be employed to achieve a target employment level. The reduction in ill-health retirement in the early 2000s reduces this value by 2.5%; the reduction observed around the time of the 2006 reforms analysed here by a further 1.5%. Our best estimate of the effect of the reforms in the next section suggests that little of this last reduction can be attributable to the reforms themselves – although we find evidence that reductions of this magnitude were achieved in those forces with significantly higher-than-average ill-health retirement rates – for which the reduction in ill-health retirement in this period reduced average retirement tenure by just under 6 months.

The other columns of Table 2 are our calculations of the total savings both from the remainder of the 2006 reform package and the subsequent 2012 reforms. In steady state, combining the 2006 reforms to accrual rates, pension age and ill-health retirement reduces discounted pension liabilities by nearly a quarter. This is a large number, but it needs reiterating that only the ill-health retirement rate reduction occurs ‘up front’ given that the reform only applies to new entrants to the police forces. The unsatisfactory nature of this reform, which delayed any major change until long in the future, plus the belief that the normal age of retirement was still too low, precipitated the 2012 reforms which reduce the value of pension liabilities still further. These reforms will kick in more quickly because they apply to all serving police officers, but accrued rights are preserved under the existing plans and, moreover, there is a ten year basic ‘window, plus other concessions, by which those nearing retirement are exempt from these reforms. Moreover, they are particularly sensitive to the discount rate chosen, not least because of the significantly higher level of contributions.

Finally, the incidence of these reforms can be examined. The broad effect of the reforms is to reduce the liabilities that accrue to national taxpayers. The difference between the changes in the gross and net liabilities illustrate the differential effects of changing contributions and lower benefits – despite the lower contribution rates in the 2006 reform, these are outweighed by the reduction in benefits – whilst the 2012 reform unequivocally hits contributing police officers. Note, again, the intergenerational implications of the reforms, with only new entrants affected by the bulk of the 2006 provisions, with the 2012 changes shifting the incidence forward to existing members who are more than ten years from normal pension age.

4. The reforms to ill-health retirement

This section examines three issues. First, what factors underlie the variation in ill-health retirement rates across police forces? Second, how did the 2006 reforms impact on the level of ill-health retirement – both through targeting of high-rate forces (as described in Section 2) and the introduction of a cost-sharing mechanism (to be described shortly)? Finally, what are the implications of cost-sharing in the post-2006 period given the differential capacities of police authorities to raise local property taxes?

3.1 Determinants of ill-health retirement; impact of 2006 reform

As the discussion suggested in Section 2, reforms to the ill-health retirement regime presumed that persistent variations in retirement rates across police forces arose in large part from inadequate workforce management and lax assessment of disability in a sub-set of forces. These factors could be susceptible to reforms introduced at the national level. However, in modelling ill-health retirement, we should take account of other factors: officers in some forces face disproportionately stressful environments with an associated persistent higher incidence of ill-health. We also need to check that variations in ill-health retirement rates from year to year are not wholly random so that any statistical effects of a reform on retirement rates are essentially spurious. We investigate both these possibilities.

To set the scene, Figure 1 graphs the distribution of ill-health retirement rates across police force in England and Wales for fiscal year 2005-06, just before the various reforms to the retirement regime described in the previous section were implemented. The range of ill-health retirement rates is large in Figure 1, but this may reflect transitory circumstances across police forces, especially among smaller forces where the numerator of the ratio is relatively small. To handle this transitory aspect, Figure 2 uses panel data on ill-health retirement rates by police force to examine which police forces have systematically higher (or lower) rates than the average for the period 2002-03 to 2005-06. Running a simple fixed effects police force-level regression to control for year-on-year variability demonstrates that there are several police forces with statistically significantly higher ill-health retirement rates than the average over that period (those with significant coefficients at 5% or above are indicated by the darker bars in Figure 2).

Given these systematic disparities in ill-health retirement rates, we use reduced form econometric models to examine factors underlying differences in ill-health retirement rates and also the impact of the 2006 reforms on retirement rates on 42 police forces in England

and Wales over the period 2002-03 to 2009-10.¹¹ The dependent variable is the (ill-health retirement rate per 1000 police officers)_{it} for the *it*h police force at time *t*. This rate is assumed to depend on several factors:

Characteristics of police officers. Ill-health may correlate with personal characteristics such as age, gender, ethnicity and underlying health. Given that we are working with force-level data rather than individual data, this implies that forces with, for example, a higher proportion of older police officers might have a higher incidence of ill-health. In this data set, evidence on force-level characteristics are limited, and we use *normal retirements per 1000 officers* as a proxy for age structure, since there is clearly a strong correlation between having older police officers and the incidence of normal retirement through the pension scheme.¹²

Stress and intensity of work across police forces. Police officers working in more stressful settings (for example, inner city areas) may face higher levels of risk of disability and ill-health. Several variables are used to proxy aspects of local policing, mostly taken from CIPFA (2011) and from Office of National Statistics data. The covariates utilised are: the *local crime rate*: number of notified offences per 1000 population; *population density per office* as a proxy for operating in urban areas; *local crime clear-up rate* as % of recorded offences to capture any residual intensity of policing; *local area unemployment rate*, using Office of National Statistics data matched into police areas; and *local area wage relative to the average wage for England and Wales*, obtained by mapping data from the Annual Survey of Hours and Earnings (ASHE) to police authority areas, the last two variables assumed to reflect differences in relative deprivation across police areas.¹³ We note that the measured effects of these last two variables may be confounded by a degree of collinearity and by the effect of local unemployment rates and earnings on the *outside options* available to retiring police officers.¹⁴

¹¹ We exclude the (small) police force of ‘City of London’ from among the 43 England and Wales forces as we have no local area control variables.

¹² Measures of the health status of police officers would obviously be a good predictors of ill-health and therefore, presumably, ill-health retirement. However Winsor (2012) noted: “The physical fitness of police officers, and some staff, are tested as part of the recruitment and probation process but, unless they undertake certain specialist roles, never again thereafter”, (*ibid*, p.211). Extraordinarily, no data derived from fitness or health tests on police officers therefore exist.

¹³ It should be noted that ASHE data are the most comprehensive sources of earnings data in England and Wales, being a 1% survey of social insurance records, but that ONS applies some *caveats* to the employment weightings. The matching uses local authority employment weights to aggregate the pay data into police force areas.

¹⁴ Given that police wage rates are set nationally, the relative wage variable also effectively captures the ratio of local wages to local *police* wages. The mapping of local earnings into local police

Police force early retirement policy. As already described, police forces have differed widely in their monitoring of ill-health and disability claims and therefore in their levels of ill-health retirement. We proxy this by a police force area dummy variable.

Policy changes. These involve the policy changes introduced in 2006 and described in the previous section. Ill-health is trended downwards from the late 1990s, so we utilise a trend in the specification but allow this trend to diverge between ‘high’ ill-health retirement rate and other forces after the policy intervention.¹⁵ We utilise two definitions of ‘high ill-health retirement rate’ forces, one based on ‘observables’ and one based on our own method of identification:

Definition 1: those forces which had an ill-health retirement rate in excess of 6.5 per 1000 in any financial year in the period from 2003-04 to 2005-06.

Definition 2: those forces which have a significant above average ill-health retirement rate pre-2006-07 (i.e. those with a positive and significant fixed effect as depicted in Figure 2).

The results of this exercise are described in Table 3. It shows an insignificant association of ill-health retirement rates with age structure as proxied by the rate of ordinary retirements. However, we might not anticipate strong associations in the data between personal characteristics and ill-health retirement, except perhaps with underlying measures of health status that are not available for the reasons described earlier (see footnote 18).

Local variations in ‘stressfulness’ of policing are a more promising avenue and indeed there is statistical evidence that variation over forces and time in some of these indicators are correlated with ill-health retirement rates: in particular there is a significant positive association with population density and with high unemployment as predicted *a priori*. There is therefore evidence that variations in ill-health retirement rates across forces are not simply

earnings across police forces is illustrated graphically in Winsor (2012) Volume 2, Appendix 3, pp.686-689. A correlation matrix of the variables used in the present analysis is given in Crawford and Disney (2012).

¹⁵ Inspection of the two (non-overlapping) series of aggregate data from HM Treasury (2000) and the aggregate of the police force data available to use from 2002-03 to 2009-10 suggests that a downward trend is a plausible assumption over the longer period, although a linear trend of course could not be used for future out-of-sample predictions – indeed post-2006-07 there is no discernible downward trend in the data. Within our data period from 2002-03 onwards, there is a particularly sharp fall in ill-health retirements between 2002-03 and 2003-04 which does not appear to be explained by any specific policy. Average ill-health retirements in the post reform period 2006-07 onwards are 38% lower than the pre-2006 average when 2002-03 is included, and 23% lower when 2002-03 is excluded, in our data window. For this reason we are very cautious in interpreting any *aggregate* effect of the policy reform and so we focus on the impact only on ‘high’ ill-health retirement forces.

the result of lax administrative procedures in relation to the monitoring of poor health and disability in some forces.

Variations in stress of policing are not, however, the whole story as demonstrated when we model the policy reforms. Table 3, columns (1) and (2) confirm that the data are consistent with a negative time trend of 1 in 1000 *per year* over this period (but see the discussion in footnote 21). We focus on the coefficient on the interaction terms of the trend post-2006 with our two measures of pre-2006 ‘high ill-health retirement rate force’. Although Definition 1 is an easily observable measure to central authorities, it is contaminated by year-on-year variance in rates of ill-health retirement, and we prefer Definition 2 as characterising forces with *persistent and statistically significant* above-average ill-health retirement rates in the pre-2006 period. The difference between the interactions suggests that the reform reduced the ill-health retirement rates of the ‘high’ forces by around 3 per 1000 in the period under consideration which gives a reduction in total pension liabilities *for these forces alone* of just under the percentage reductions in Table 2 when comparing the adjacent columns labelled ‘IHRR6’ and ‘IHRR2’. The impact on the overall pension liabilities across all forces is, of course, considerably smaller.

At first sight, therefore, these results suggest a continuing but decreasing rate of decline of ill-health retirement among ‘average’ forces coupled with a faster rate of decline in the ‘high’ ill-health retirement forces after the reforms were implemented. Both results might be attributable to the policy but it is also possible, especially using Definition 1 of the ‘high ill-health retirement rate forces’, that there is some degree of ‘regression to the mean’ taking place in the dispersion of retirement rates over time. We therefore undertook placebo tests which shifted the structural break from 2006-07 to other years – if the coefficient was equally significant, it suggests that we are more likely to be observing a statistical process than a policy-driven process. To summarise the results of this sensitivity analysis, we cannot rule out that the shift among high retirement rate forces took place as early as 2004-05 – though no later than 2006-07.¹⁶ This may derive from a response to early indications of the imminent policy change (Home Office, 2004, Annex B) or simply suggest that, in our relatively short data window, we cannot separately identify policy effects from statistical processes with great precision. *3.2 The introduction of cost-sharing for ill-health retirement*

Background: financing of the police in England and Wales

¹⁶ Results of these and other sensitivity tests are available on request from the authors.

Another component of the 2006 reform may however have greater long-term implications for ill-health retirement. This concerns a change in the financing arrangements for pensions. Under the pre-2006 funding regime, all expenditures on police pensions, whether via normal or ill-health retirement, were transferred through the main central block grant to police authorities – the Police Main Grant – from the Home Office whilst contributions by serving police officers to the police pension plans were simply transferred back to the central government: in other words, the central government effectively financed all pension payments net of employee contributions.

Under the arrangements from 2006-07 onwards, each police authority established a pension account into which employee and employer contributions within that police force would be paid. This would then be used to pay the pensions of both new and existing retired police officers. Given the large stock of retired police officers relative to serving police officers, this account would generally be in deficit, and would be topped up by central government to remain in balance.¹⁷ Under the new proposals, this ‘top-up’ would be done in full for ‘normal’ retirements. However, for ill-health retirements, the local police authority was required to pay an upfront charge of twice the average pensionable pay for the officer concerned into the pension account, with the ongoing pension award being financed from contributions or by central government subsidy (Home Office, 2005). For a realistic example, this would imply an upfront capital charge on the new pension account of three or four times the new pension award. For a plausible discount rate, and assuming life expectancy of ill-health retirees to be somewhat less than life expectancy of normal retirees, this upfront cost could constitute around one-fifth of the total projected pension cost over the remaining lifetime.¹⁸ This capital charge on the local police authority would then have to be financed either from greater efficiency in spending the central grant or by raising revenue from local property taxes to rectify the shortfall in the pension account in relation to these retirements.

This shift of part of the burden of ill-health retirement onto local police forces is not the only policy that might be envisaged. An alternative reform, of simply centralising all decisions concerning ill-health retirement, seems to have been ruled out on the grounds that

¹⁷ Home Office figures suggest that, in 2008, there were around 131,000 active members of the 1987 PPS and 12,000 active members of the 2006 NPPS. There were 104,000 retired members of the 1987 PPS as well as deferred members and survivors of members who were, or would, receive pensions.

¹⁸ The calculation assumes retirement on a pensionable income of £40,000 at age 50, a pension of £24,000, a real discount rate of 2% and a life expectancy beyond retirement date of around 25 years. This would of course understate the relative burden on the pension account for those officers who entered the police service later or who died much earlier due to severe disablement.

‘deployability’ and workforce management are the concerns of local police forces rather than national government. As in the United States, the independence of police deployment and management from national government intervention is regarded as one of the bedrocks of political and jurisdictional independence. However given the much greater involvement of the UK national governments in the financing of local police activities, as described in Section 2.2, the rebalancing of existing financial arrangements was arguably long overdue given the incentives to transfer the costs of local discretionary retirement on to national government as described in the Introduction to this paper. The idea that the generosity of components of public sector remuneration – whether in the form of current or deferred pay – depends on local taxable capacity has been the focus of a small but interesting published literature in the United States on the topic, although it has not focused on retirement provisions *per se*.¹⁹

To understand the implications of this change for particular police forces, a brief explanation of police funding in England and Wales is required. The largest bulk grant for policing for England and Wales (accounting for, on average, 35% of police funding in 2010-11) comes from the Home Office through the Police Main (or block) grant which is allocated by a complicated mechanism known as the Police Funding Formula (PFF) (Home Office, 2012), described more fully in Crawford and Disney (2012).²⁰ A further, 11% comes through specific grants for particular activities and priorities (e.g. for ‘neighbourhood policing’ and for counter terrorism), and around 30% from the Department of Communities and Local Government (DLCG) and the Welsh Assembly. The remaining funds are raised locally, through a precept levied on local residential properties.²¹

Although most financing of police forces comes through block grant funding provided by national government, a significant component – varying from 12% to 45% of total budget across forces in 2011 – is raised from local property taxes. The dominant source of local financing of police activities is the ‘precept’; levied as part of Council Tax on local

¹⁹ The literature includes Inman (1982), Epple and Schipper (1981), Leeds (1985), Gyourko and Tracy (1989, 1991) and Poterba and Rueben (1995).

²⁰ For further discussion, see Universities Police Science Institute (2011). This paper remarks that the current government is committed to reforming and simplifying the grant allocation procedure but notes that: ‘Such is its complexity it may even be beyond significant change’ (*ibid*, p.3)

²¹ Small additional sums are raised locally from fines and fees, from some charges for policing (e.g. for certain sports events) and, for individual police forces, from lending police officers to other forces (‘mutual aid’) or from revenue from the loan of specialist units (e.g. underwater recovery teams) between forces. The DLCG is responsible for financing other local government activities in England; again with Council Tax and also the ‘business rate’ as the main sources of local finance.

residential property. This tax was introduced in 1993 replacing previous property taxes, and allocates each residential property to one of eight bands assessed in 1991 in England (2003 in Wales) depending on size of the property and other features. Newly constructed properties are assigned a band and properties with major reconstruction may be rebanded. Each local authority sets a Council tax (and police precept rate) as an annual levy on a middle-banded property (Band 'D'); a nationally fixed formula then sets the rate of tax on each band as a fixed multiple or fraction of that levy. The tax base is therefore the number of 'Band D-equivalised properties' and the revenue that can be collected by a local police force from the precept depends on the total number and composition of properties in the area times the rate of precept set by the local police authority. It is therefore apparent that the elasticity of revenues from changing the precept depends on this original banding assessment of residential property in the area, as well as any new construction.

Note also that the multiple of banding rates from lowest to highest band is much more limited than the range of property values in any given area and, second, that house price increases (or falls) do not *per se* increase property tax revenues since the formula relating residential property type to band has remained fixed since the inception of the Council Tax. Revenues rise when the rate of precept on properties is increased, not because house values rise (other than compositional effects arising from new builds and any rebanding based on home improvements). Moreover, central government has at various times attempted to cap increases in the precept of specific police forces if these are seen to be 'excessive'.

Figure 3 shows how the share of financing raised from the local precept varies across local police forces in 2005-06. As we model shortly, these differences partly depend on the nature of residential property, but they also depend indirectly on the formula allocating central grants, on any 'capping' procedures, and also on the expenditure needs of individual police forces. Figure 4 shows that revenue obtained from local sources by police forces tended to increase recently as a share of total income, especially in the first part of the period. This increase slowed in the second party of the period, in part reflecting 'capped' precept increases as part of a general attempt to limit Council tax increases by DCLG.

Statistical analysis of local revenue-raising and ill-health retirement

In this final section, we examine the determinants of the 'precept' – the property tax which provides the locally-funded component of police funding. We show that the average real value of the precept levied per property in general depends on area characteristics (notably

the quality and density of housing) and on the demand for police officers' services. Our primary hypothesis is twofold: first, that the level of ill-health retirement should have no effect on the precept rate pre-2006, since the costs of ill-health retirement were wholly covered from central block grant funding in that period. This turns out to be the case. Second, however, there is evidence of a positive relationship post-2006, when police forces became responsible for part-funding ill-health retirement of police officers.

Our dependent variable is the *real police precept levied per property (in £)* by each police authority in every year. In our reduced form specification, we assume that this variable is affected by a number of factors that broadly affect the elasticity of the supply of funds and the demand for policing. We test for any association with the rate of ill-health retirement, primarily in the financial year 2006-07 onwards, when local police authorities became responsible for part-funding ill-health retirement. Summary statistics for both this variable and the covariates are given in the Appendix to Crawford and Disney (2012).

The supply of funds is driven by the density and banding of properties in the police authority area. We use two variables derived from CIPFA data to capture this: the number of Band-D equivalent properties and the size of the population.²² We predict that the coefficients on these variables will be of opposite sign and that, overall, ability to raise funds is positively related to the ratio of properties per head. We also test a proposition advanced by Glaeser and Ponzetto (2012) in the context of public pensions. Since there are several billing authorities for property taxes (which incorporates the police precept) within each police authority area (because police authorities are larger administrative units than local public authorities), it may be argued that the link between local police services and the level of precept is less transparent than it is for other public services; hence the costs of the police service are partially 'shrouded' in multiple jurisdictions.

The demand for additional funds for policing is driven by the type of indicators described earlier in the context of ill-health retirement, such as the reported crime rate, clear-up rate, and measures of local deprivation. We also include the number of officers in the local police force. This variable is, strictly speaking, endogenous to a structural model of the police precept (as is, potentially, the notified crime rate). In our reduced form approach, this variable

²² To reiterate: the number of properties utilises a normalisation, like 'equivalent income', by which higher (lower) value properties are treated as a multiple (fraction) of average band properties in calculating the base. Thus an area with a high proportion of high-banded properties will be treated as if it has many more properties per head than a poorer neighbourhood with low banded residential housing (CIPFA, 2012).

is present to capture any differential local community preferences for hiring police officers over and above those provided for from central funding.

Table 4 describes the results from various specifications. These are fixed effect models with year dummies, with the inclusion of various combinations of covariates. In general, the level of precept per property is positively associated with the number of equivalised properties and negatively associated with the size of the population, though these results are sensitive to choice of covariates. The ‘shrouding’ variable – number of billing authorities – is correctly signed but not significant. In some specifications, our ‘demand’ variables are also significant, but the reduced form nature of the specifications limits the interpretation. Clearly there is scope for fruitful further research on a more structured model of local police funding.

In the present context, however, it is the last two variables that are of primary interest. The first is ‘ill health retirements per 1000 officers’. This has no effect on revenues raised locally over the period as a whole, as indeed should be the case since, until 2006, these retirements were wholly financed from central sources. However the interaction of this variable with the post-2006 period is highly significant, irrespective of the combination of covariates. This is the period when local police authorities *did* become partially responsible for the funding of ill-health retirement. This result is strongly consistent with the idea that some authorities were prepared to use their capacity to raise local precept in order to finance higher rates of ill-health retirement, so offsetting in part the curbs on such policies originating from central government.²³

Whilst this is an interesting result in the context of the present paper, caution must be exercised before asserting that the higher precept simply paid for the higher ill-health retirement. This is because the coefficient implies that, at the mean, the amount of money raised from the precept with each extra ill-health retirement significantly exceeded the direct costs of financing that ill-health retirement for a representative pension value. Even if we allow for fixed costs of replacement and training, the figure is probably at least double the required sum. We would therefore suggest that this is an *association* in the data – police

²³ The lack of significance of ill-health retirement for the whole period is effectively a placebo test that we are not observing some overall spurious association between ill-health retirement and precept per property. Among our sensitivity tests, we excluded the London Metropolitan Police from the sample, since their scale of operations is so much larger than any other police force – see the statistical appendix. This exclusion made no significant difference to the findings – a result which is available on request from the authors.

authorities for which it was easier to raise precept used the extra revenue for a number of activities including, *inter alia*, a higher level of ill-health retirement.

5 Conclusion

This paper has investigated the police pension reforms introduced in recent times in England and Wales. The reforms should be contextualised by the somewhat different institutional features of police forces in Britain from those in the United States – notably central bargaining over pay and pensions in the former – although local police authorities in Britain have a degree of autonomy in the fraction of police funds that is raised from local sources, in the levels and deployment of police officers and staff, and in the extent of discretionary early retirement through the route of ill-health.

We describe and simulate the range of pension reforms introduced in 2006. The changes to accrual rates, date of normal pension age and indexation have significant effects on pension liabilities in the long run, but most are limited insofar as they only applied to newly recruited officers and would have had no effect until those officers started to retire at some future date. The pension reforms which are being introduced by 2015 are much more radical insofar as they apply to all new pension *accruals* even though longer serving officers will be exempt from their effects. The combined effect of these reforms therefore is to transfer costs from national taxpayers to police officers, albeit treating generations (cohorts) of police officers differentially.

We then focus on the reform of early retirement by police officers on grounds of ill-health. This was subject to a high degree of local managerial discretion but was, until the 2006 reforms, wholly financed by national taxpayers. This incentive problem has led to high levels of ill-health retirement in previous decades and considerable variation across police forces. After controlling for factors that capture differentially stress of police officers across forces we show that the 2006 reform of police pensions reduced the rate of ill-health retirement, but largely among those forces that had been targeted as having ‘high’ rates of ill-health retirement by the national governments. The effects on pension liabilities are very small but, unlike the more radical reforms, have an immediate impact.

In the final section, we examine the cost-sharing proposals for financing new ill-health retirees also implemented in 2006, which shifted part of the burden onto local police authorities. Since local authorities vary in their taxable capacity, we test the hypothesis that forces that wished to have higher-than-average ill-health retirement rates after this date were

prepared to finance these rates by levying a higher ‘precept’ (tax) on local household properties, once we control for an estimate of this taxable capacity. We derive a simple reduced form model to ‘explain’ the determinants of local real precept per head in each police authority. We show that the level of ill-health retirement was *only* associated positively with the precept rate from 2006-07 onwards, once we control for other factors including taxable capacity. This strongly fits our prior hypothesis, insofar as there should have been no relationship between precept and ill-health retirement rates pre-2006 when all retirements were centrally funded.

The last finding generates a new finding on incidence. The principle of cost-sharing in relation to ill-health retirement suggests that, in local jurisdictions with a higher taxable capacity, a part of the long run burden (and indeed a disproportionate amount of the upfront burden) of ill-health retirement is shifted from national taxpayers to local taxpayers. In areas with the responsiveness of property taxes to additional expenditures is likely to be lower, the burden is shifted from national taxpayers onto police forces, which either have to reduce ill-health retirement or find cost savings elsewhere in their budgets. The establishment of pension accounts for individual police forces may have had little impact on pension liabilities in the short run. However they may preface further reforms in the future. Further moves toward cost-sharing, for example in relation to pension costs more generally, and not just ill-health retirement, could be envisaged in the future whereby a significant component of pension costs over and above employee contributions could be raised from local taxation. However such reforms are not yet on the agenda.

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Table 1: Summary of Police Pension Plans and Reforms

Pension plans	Police Pension Scheme (PPS) 1987	New Police Pension Scheme (NPPS) 2006	'Reform Design Framework' 2012
Eligibility	Joined force up to 05-04-06	Joined force from 06-04-06	All officers but transition provisions
Employee contribution rate	11% of salary	9.5% of salary	13.7% of salary
Maximum pension	2/3 final salary	½ final salary + 4×lump sum	Career average revalued at CPI+1.25%pa
Accrual rate	1/60 th 20 years+1/30 th after 20 years	1/70 th	1/55.3 th
Maximum service full pension	30 years	35 years	No cap
Earliest pension	48.5 (as early as 46 if transferred in service); deferred 60	55; deferred 65	Normal age 60 with transition provisions; 55 early retirement with actuarial reduction; deferred SPA
Indexation of pension	Was to RPI (2010 onwards to CPI)	Was to RPI (2010 onwards to CPI)	CPI
Survivor's pension	50% of member's pension	50% of member's pension	50% of member's pension
Ill-health benefit	One level of benefit	Two tier benefit based on severity	Two tier benefit based on severity

Notes: RPI = retail price index; CPI = consumer price index, SPA=state pension age (currently 65 for men, 62 for women, rising for both sexes to 66 by 2020 and 68 by 2046). Under UK provisions, pension lump sums are generally treated by the tax system more favourably than annuities (pensions) up to a ceiling, therefore commutation to lump sum payments are generally favoured; in PPS and 2012 reform, therefore, police officers could also have part of the pension taken as a lump sum (as in other pension plans). The 2012 contribution rate is an average weighted across bands of earnings. The increase in contribution rates in 2012 for those in the 2006 PPS is lower than those cited here.

Table 2: Reductions in police pension liabilities arising from various reforms

Results:	PPS			NPPS	2012 Reform	
	IHRR0	IHRR12	IHHR6	IHRR 2	IHRR 2	IHRR 2
Ill health retirement per 1000 officers	0	12	6	2	2	2
Accrual rate	1/60 th (2/60 th after 20 years)	1/60 th (2/60 th after 20 years)	1/60 th (2/60 th after 20 years)	1/60 th (2/60 th after 20 years)	1/70 th + 4× lump sum	1/55.3 career average
Gross average pension liability per officer (£)	370585	358908	364523	368669	324377	256524
Net average pension liability per officer (£)	296252	291434	293669	295514	250390	136138
Intake needed for force size of 120000	5844	6335	6084	5923	5290	4909
Gross Pension Liability of forces (£ billion)	2.17	2.27	2.22	2.18	1.72	1.26
<i>(%+/- from previous column)</i>	-	+5.0%	-2.5%	-1.5%	-21.4%	-26.6%
					-22.6%	
Net Pension Liability of forces (£ billion)	1.73	1.85	1.79	1.75	1.32	0.67
<i>(%+/- from previous column)</i>	-	+6.6%	-3.2%	-2.0%	-24.3%	-49.5%
					-25.8%	

Notes: All values discounted to age of entry at 2% per annum, at constant prices and 2012 parameter values. For construction of values: see text. IHHRX=Assumed Ill health retirement rate per 1000 officers. PPS=Police Pension Scheme (1987); NPPS=New Police Pension Scheme (2006). 'Average pension liability per officer' × 'Intake needed' gives 'Pension liability of forces'. 'Net' excludes employee contributions.

Table 3: Modelling ill-health retirement rates across police forces

Explanatory variables:	(1) Definition 1	(2) Definition 2
<i>Employee characteristics</i>		
Normal retirements per 1000 officers	0.04 (0.02)	0.04 (0.02)
<i>Stress factors</i>		
Crime rate (notified offences per 1000 population)	0.01 (0.02)	0.01 (0.02)
Clear-up rate (per cent of recorded offences)	0.04 (0.04)	0.03 (0.04)
Population per officer	0.02* (0.01)	0.02* (0.01)
Local area unemployment rate (%)	0.41* (0.18)	0.46* (0.18)
Local area wage relative to average wage (%)	-4.11 (2.79)	-3.73 (2.77)
Time trend	-1.09*** (0.16)	-1.11*** (0.16)
Time trend × post-2006	0.35*** (0.10)	0.36*** (0.10)
Time trend × post-2006 × “high” IHR force	-0.33** (0.10)	-0.45*** (0.12)
Force dummies	Yes	Yes
R ²	0.7893	0.7930
Number of observations	336	336
F = (.)	F(50, 286) =26.18	F(50, 286) =26.74

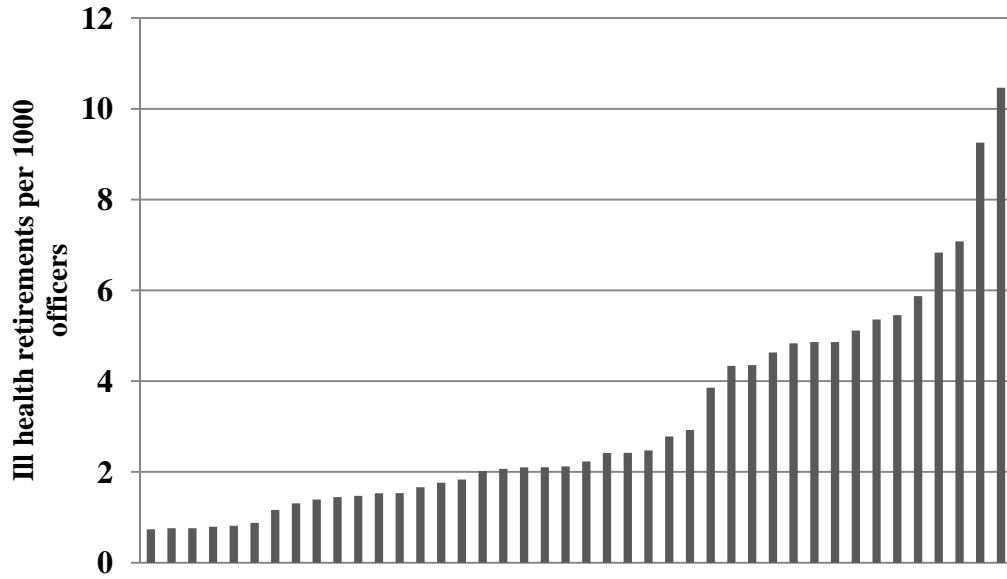
Notes: ‘definitions’ and variables as defined in text. *, ** and *** indicate significance at the 10%, 5% and 1% level from a 1-sided test.

Table 4: Modelling real police precept levied per property (£)

Explanatory variables:	(1)	(2)	(3)
Number of Band D-equivalent properties (000s)	0.59*** (0.08)	0.54*** (0.08)	0.04 (0.11)
Population (000s)	-0.11*** (0.02)	-0.10*** (0.02)	-0.06** (0.02)
Number of billing authorities in police authority area	0.22 (1.08)	0.09 (1.12)	0.37 (1.02)
Local area unemployment rate (%)	-	0.30 (1.54)	0.97 (1.44)
Local area wage relative to average wage (%)	-	-17.71 (39.88)	5.60 (36.78)
Number of officers in force	-	-	0.02*** (0.03)
Crime rate (notified offences per 1000 population)	-	0.04 (0.09)	0.26** (0.09)
Clear-up rate (per cent of recorded offences)	-	-	0.34* (0.17)
Ill health retirements per 1000 officers	-0.16 (0.37)	-0.18 (0.38)	-0.36 (0.35)
Interaction Post-2006 × ill health retirements per 1000 officers	1.21* (0.51)	1.20* (0.51)	1.28** (0.47)
Force dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Adjusted R ²	0.8896	0.8886	0.9061
Number of observations	334	334	334
F = (.)	F(53, 280) =51.61	F(56, 277) =48.43	F(58, 275) = 56.38

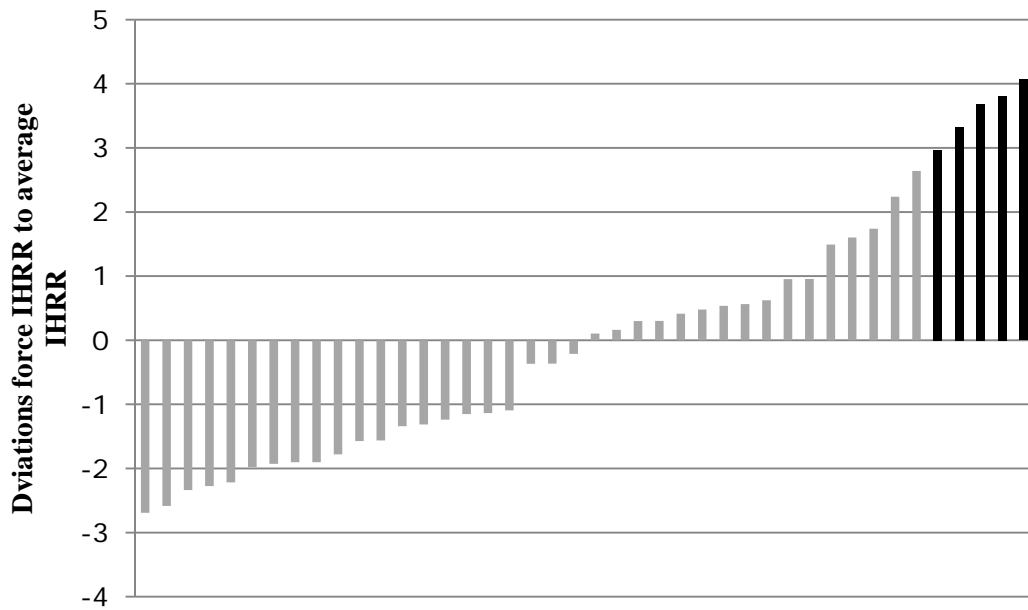
Note: Variables as defined in text. *, ** and *** indicate significance at the 10%, 5% and 1% level from a 1-sided test.

Figure 1: Ill-health retirement rates by police force, England and Wales, 2005-2006.



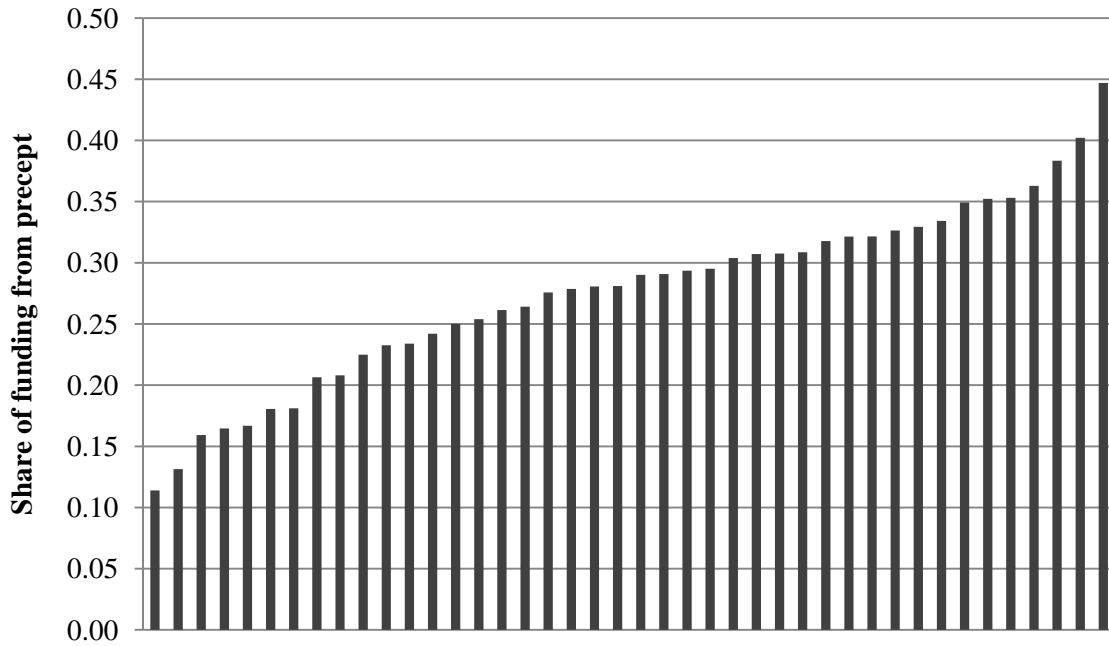
Source: Home Office returns and CIPFA *Police Actuals* 2005-06.

Figure 2: Differences of ill-health retirement rates (IHRRs) from average, 2002-03 to 2005-06



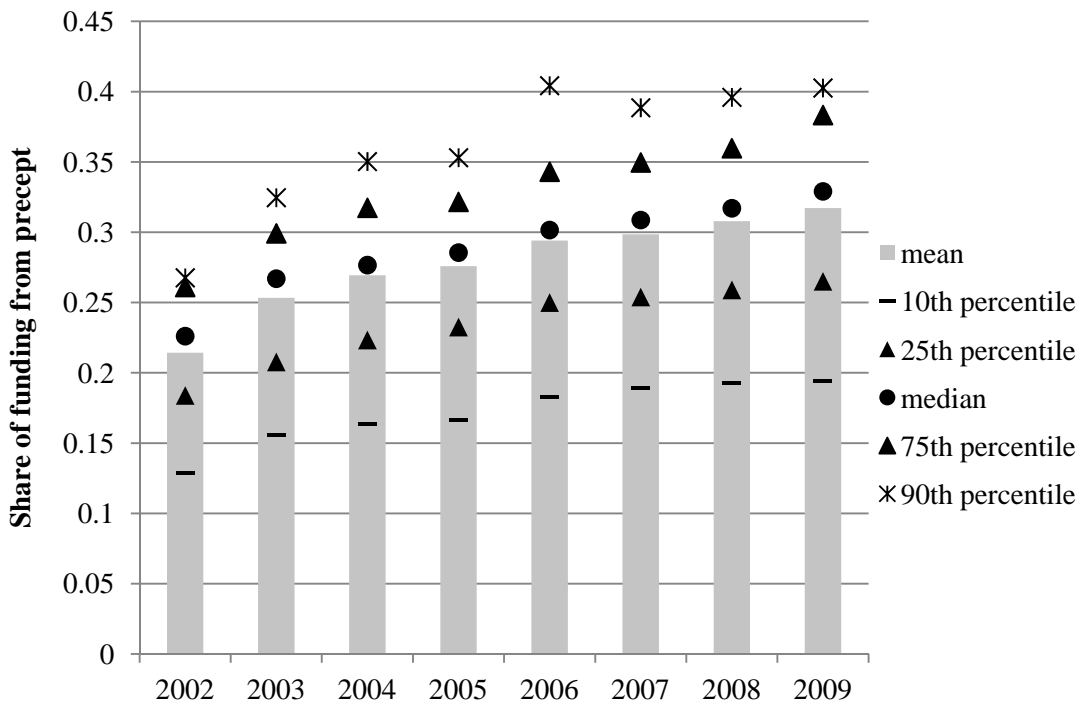
Note to Figure 2. Source: as Figure 1, various years. Estimated by regression of police area fixed effects on IHRRs for the period. Dark shaded bars are those significantly positive at 1% or 5% level.

Figure 3: Share of funding by police force raised from local precept, 2005-06



Source: CIPFA *Police Actuals*, 2005-06

Figure 4: Changes in the share of funding raised from local precept, 2002-03 to 2009-10



Source: CIPFA *Police Actuals*, various years.

Appendix Table: Summary Statistics

<i>Variable</i>	<i>Min value</i>	<i>Median</i>	<i>Mean</i>	<i>Max value</i>	<i>SD</i>
Ill-health retirements per 1000 police officers by force/year	0	2.58	3.40	17.2	2.81
Normal retirements per 1000 officers	0	27.1	27.0	47.4	7.0
Crime rate (notified offences per 1000 population)	44.0	88.1	91.5	160.7	22.7
Clear-up rate for recorded crimes (%)	14.0	27.0	28.4	68.0	6.40
Population per officer	235	462	447	592	76
Local area unemployment rate (%)	2.2	4.6	5.0	11.6	1.6
Local area wage relative to average wage (%)	0.76	0.91	0.95	1.38	0.13
<i>Precept variables</i>					
Real police precept levied per property (£)	0	139	140	218	30
Share of funding raised by local precept (%)	0	0.27	0.27	0.48	0.08
Number of Band D-equivalent properties (000s)	162	333	458	3495	497
Population (000s)	484	1012	1355	11448	1649
Number of billing authorities in police authority area	2	6	8.7	32	5.2
Number of officers in force (FTEs)	948	2170	3266	32988	4507