Wage regulation and the quality of police officer recruits

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Abstract

The paper analyses the impact of centrally regulated pay on the quality of applicants to be police officers in England and Wales using a unique dataset of individual test scores from the national assessment that is required of all applicants. It provides empirical evidence of two distinct channels through which centrally regulated pay induces variation in the quality of applicants. First, national wage setting implies that relative wages between the police and other occupations vary spatially. We show that higher outside wages are associated with lower quality applicants, using several spatially-varying measures of outside wages. Second, nationally-set wages cannot adjust to reflect spatial variation in the disamenity of an occupation. We demonstrate that a greater disamenity of policing (as measured primarily by area differences in crime rates and in the proportion of crime that is violent) is also associated with lower quality police applicants.

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1. Introduction

Pay rates for public sector workers throughout most of Europe and parts of the United States are centrally negotiated and heavily regulated: for example, by applying common scale rates across local employers. This can have a number of important implications. First, national wage setting often leads to spatial variation in public sector pay differentials relative to private sector outside options. Second, national wage setting means that wages cannot adjust to reflect spatial differences in the disamenity of working in a public sector occupation. These facts lead to the natural inferences that (all else equal) in areas where regulated public sector pay is low relative to private sector pay, or in areas where the disamenity of the public sector occupation is high, public sector workers are of lower quality (and vice versa).

In this paper we utilise a unique dataset to analyse the impact of centrally regulated pay on the quality of a particular group of public sector workers: the police in England and Wales. Our paper is the first to our knowledge to consider simultaneously both the aforementioned channels through which national wages may affect quality, and we provide empirical evidence in support of both relative wages and the disamenity of policing affecting the quality of applicants to the local police force. Furthermore, the novel data that we use – individual test scores from the national assessment required of all applicants – provide a direct measure of 'quality' pertinent to the occupation in question, and therefore represents an improvement over the existing literature that has relied on inference from prior schooling or institutional performance.

Our work brings together two strands of the existing literature. First, our paper augments studies which confirm the proposition of Borjas (2002) that lower pay of public sector workers relative to outside options lowers the supply and worsens the quality of employees in the public sector. A number of studies, notably Nickell and Quintini (2002) in the United Kingdom and Hoxby and Leigh (2004) and Bacolod (2007) in the United States, use pre-entry educational test scores as measures of ability and show that temporal and/or spatial variations in public pay relative to private pay affect public sector recruitment. In similar vein, a recent paper by Dal Bó, Finan and Rossi (2013) utilises an interesting public sector recruitment drive with a degree of randomisation of pay offers to show that higher public sector wages and

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better job attributes attract higher quality workers to the public sector, as measured by IQ, personality and aptitude tests. The implications of differential worker quality on public sector *performance* have been noted in some studies. Propper and Van Reenen (2010) suggest that spatial variations in mortality rates across public hospitals in the UK's National Health Service can be linked to differences in worker quality arising from these relative pay disparities and therefore indirectly to centralised pay regulation.[1] Propper and Britton (2012) obtain the same result in terms of regulation of the pay of public school teachers and school performance in England, with similar findings on teachers in the United States by Hanushek *et al* (2004).

Second, our paper builds on the literature on compensating variation and wage differentials. In the standard approach, in competitive labour markets wage differentials in part compensate for the non-pecuniary (dis)advantages of a particular occupation (Rosen, 1986) and for the (dis)advantages of locating and working in a particular geographical area (Roback, 1982, 1988). Where wages are centrally regulated, such compensating adjustments do not occur (at least, overtly) and the quality and composition of the workforce is thereby affected by these (dis)advantages. Although in some public sector occupations, variation in non-pecuniary characteristics *within* the occupation may be relatively limited, there is some evidence of this variation being a factor in the supply of workers to public health care (Di Tommaso, Strom, and Saether 2009) and it is most certainly true that, for example, inner city policing is a very different form of police activity from policing a largely rural area. Hence, we expect local variations in the nature of policing to play a significant role in spatial differences in recruit type and quality in the police service when wages are centrally regulated.

The police labour market has been studied much less in recent years than other public sector occupations such as teachers and workers in health professions (notwithstanding the contribution of Mas (2006) on decentralised pay arbitration awards to police officers in the United States). It should be noted that, unlike in the United States, pay of police officers in England and Wales is broadly set within a national framework, with little variation in pay (at least, outside London). To set the

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[1] This finding may also reflect spatial differences in *management* quality since the outcome measures apply to the hospital as a whole: see Bloom *et al* (2010).

scene Figure 1 illustrates the geographical variation in police relative wages resulting from centralised wage-setting, mapping the average position of junior police officers in the local hourly wage distribution for the 43 police forces of England and Wales. Not surprisingly, junior police officers lie at a higher percentile of the hourly wage distribution in predominantly rural police force areas and are significant lower in the wage distribution in the relatively affluent areas around London.

The paper now proceeds as follows. In section 2 we describe the police recruitment process in England and Wales. In section 3 we introduce a simple theoretical model, which produces some testable implications of the impact of national wage setting on applicant quality. In section 4 we describe our empirical approach and the data used, while section 5 presents our results. Section 6 concludes.

2. Institutional context

Law enforcement in England and Wales is undertaken by police officers attached to 43 territorial police forces operating at the county or metropolitan level.[2] There is not the 'layering' of federal, state and local police forces found in the United States, although there are now some specialist national agencies including the National Crime Agency. Pay levels are set through national negotiating procedures and are broadly uniform across forces, although officers in London receive a flat 'London weighting allowance' worth from 5-10% of pay by pay grade.[3]

The police recruitment process in England and Wales has several stages. It can be summarised as follows (see also HMSO, 2012, pp.76-88 and 661-673). Would-be police officers apply to their local police force, which operates a screening process to sift out unsuitable candidates such as those who fail basic standards of physical and financial fitness, have a criminal record etc. This first stage can be somewhat *ad* hoc. HMSO (2012) ('The Winsor Review') noted:

> "Candidates must apply to a police force using a standard application form. Given the number of potential applicants, forces will generally apply a practical sift of potential applicants before deciding those who are to be given an

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[2] Scotland and Northern Ireland each have a unified police force.

[3] For further discussion of the police remuneration structure, see HMSO (2011) and Crawford and Disney (2014).

application form as a first stage in the recruitment process. This can involve requiring potential applicants to attend a familiarisation event… Other forces may simply limit the number of forms that are printed… [One force] had a small number of police vacancies, and decided to limit the number of printed application forms to 500. The first 500 people who telephoned the force on an appointed day received the forms…" (*ibid*, p.77)

In addition to filling out the application form, some forces may also require a certain level of minimum educational achievement (such as a qualification at A-level equivalent) and set other, additional criteria, such as possession of a clean driving licence. The application form contains a competency-based questionnaire which must be filled in to a satisfactory standard.

Candidates who achieve this standard in the questionnaire are then submitted to the national recruitment assessment process, administered by the National Policing Improvement Agency (NPIA) between 2006 and 2012 and subsequently by the newly-established College of Policing. Known as SEARCH (Structured Entrance Assessment for Recruiting Constables Holistically), this assessment process aims to gauge candidates' performance in seven competency areas through a combination of interactive role play, written exercises, tests of verbal, numerical and logical reasoning, and an interview.[4] Each candidate is given a score for each competency area, as well as an overall score and an indication of whether he or she has passed or failed.

Pass rates have varied over time since the SEARCH process was introduced and have tended to increase as forces improve their strategy in selecting applicants for submission (since the submission of an applicant incurs a direct financial cost for individual police forces), and because information on the assessment tests (including worked examples to actual questions) has begun to be published on websites and in hard copy. However, as we shall see, pass rates vary significantly across candidates

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[4] The seven competency areas assessed are: Community and Customer Focus, Effective Communication, Personal Responsibility, Problem Solving, Resilience, Respect for Race and Diversity and Teamworking. Effective communication is further broken down into Oral Communication and Written Communication.

submitted by individual police forces and pass scores have also been changed from time to time.

A candidate who obtains at least a pass score may then be appointed to the police force which submitted him or her. If there is a surplus of successful candidates, a force can require a higher test score than the national pass mark or use some other non-discriminatory selection criterion, but it cannot hire below the pass mark – hence, if a police force lacks successful candidates, it may be able to recruit from successful applicants submitted by another force who either choose not to join that force or who, despite passing, were not hired by the force that submitted them to the assessment. Despite this possibility of joining a different force, it should be emphasised that the vast majority of successful candidates accept a job offer from the police force that submitted them for assessment (though they may in subsequent years move to another force). Overall, from 2006 to 2011, the pass rate was over 60%, and 97% of those who passed found a job as a police officer. Once employed as a police officer, the individual is placed on the national pay scale, with subsequent pay enhancements related to tenure, additional skill enhancements and promotion.

3. Theoretical model

Here we set out a simple model is to illustrate why a nationally regulated wage for police officers can result in spatial variation in the quality of police applicants. Consider an economy with two regions, $r = [H, L]$, in which there are region specific prices P_H and P_L respectively, and (potentially) region specific wages. In each region there are two occupations, $j = [P, O]$, where P is the superscript for policing and O the superscript for all other occupations. The labour market for policing is regulated in that there is a nationally set wage (W^P), while the labour market for other occupations is unregulated and wages potentially vary between the two regions.

Workers come in many skill types, $k \in K$. 'Skill' in this specific context should be interpreted as an aptitude for police work. This aptitude depends not just on observable characteristics (such as education and experience) but also potentially on characteristics that are not just unobserved to the researcher but which may also be unobserved to the sponsoring police force and to the applicant themselves, as illustrated by the fact that some candidates fail to achieve the required standard in the national assessment.

Utility of workers is given by $(W_{k,r}^j/P_r) - q_{k,r}^j$, where the term $-q_r^j$ reflects the disutility of working in a particular occupation.

The theory of compensating differentials suggests that wages in the large unregulated sector (or region specific prices) will adjust to compensate workers for differences in amenities between regions. Equalisation of utility suggests:

$$(W_{k,H}^O/P_H) - q_H^O = (W_{k,L}^O/P_L) - q_L^O$$

In contrast, wages for the police are set nationally $W_{k,H}^P = W_{k,L}^P = W^P$. They do not vary by skill type, and cannot adjust to compensate workers for spatial differences in either amenities, prices (which can be taken as exogenous to workers in the small police sector) or the disutility of policing. In other words

$$(W^P/P_H) - q_H^P \neq (W^P/P_L) - q_L^P$$

or equivalently, $$(W^P/P_r) - q_r^P \neq (W_{k,r}^O/P_r) - q_r^O$$

What are the implications of this lack of flexibility in police wages for the supply of police applicants? Suppose for simplicity that workers choose between the police and the other occupations conditional on their existing location. (This could be interpreted as workers facing a cost of migration that is greater than the regional variation in the utility from working in the police.) Then a worker of skill type i in region r will want to work in the police if:

$$(W^P/P_r) - q_r^P > (W_{k,r}^O/P_r) - q_r^O$$

Rearranging the above equation indicates that a worker of a given skill type will want to work for the police if the relative real wage premium, $(W^P - W_{k,r}^O)/P_r$, is sufficient to offset the greater disutility of working in the police $q_r^P - q_r^O$. Preferences for policing are therefore increasing in the relative wage paid in the police compared to other occupations, $W^P - W_{k,r}^O$, and decreasing in the disutility of working in the police compared to other occupations, $q_r^P - q_r^O$.

Denote the supply of workers of skill type k in region r by $N_{k,r}$, and suppose that a proportion, $\theta_{k,r}$ are seeking a job in a given period. The supply of applicants of skill type k to the police is given by:

$$S_{k,r} = \begin{cases} \theta_{k,r} N_{k,r} & if\ (W^P - W^O_{k,r})/P_r \geq q^P_r - q^O_r \\ 0 & if\ (W^P - W^O_{k,r})/P_r < q^P_r - q^O_r \end{cases}$$

The total supply of applicants is given by $S_r = \sum_k S_{k,r}$ and the effective supply of potential recruits is given by $E_r = \sum_k \lambda_{k,r} S_{k,r}$ where $\lambda_{k,r}$ is the probability of a skill type passing the national assessment.

Under the natural assumption that wages in the unregulated sector are increasing in skill type, this simple model yields a number of testable implications for spatial variations in the quality of police applicants. The quality of police applicants will be greater in regions where:

- the relative real wage paid in the police compared to other occupations is higher;
- the disamenity of working in the police compared to other occupations is lower;
- there is a greater supply of better quality workers;
- the probability that workers are job seeking is higher;

The first two of these in particular arise as implications of wage regulation in the police sector, and we provide empirical evidence in support of these propositions in the remainder of this paper.

4. Empirical strategy and data

Our empirical approach for considering the role of local wage conditions and spatial variation in the disamenity of policing on the quality of police applicants is based on data for over 41,000 applicants who were submitted to the police recruitment national assessment in the period 2007-10.[5]

Consider the simple equation:

$$S_i = \varphi ln W^P_r + \delta ln W^O_{i,r} + \rho Q_r + X_r \gamma + \tau + \varepsilon_i$$

Where S_i is the average quality of an individual police applicant as measured by their score in the national assessment; W^P_r is the local police wage; $W^O_{i,r}$ is the local outside

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[5] Few candidates were submitted in the two years after 2010 due to cuts in spending on the police as part of the then-Coalition government's austerity programme.

wage they could obtain, Q_r is the local disamenity of policing, X_r is a vector of other local area controls and τ is a set of time dummies. The implications of the simple theoretical model previously described are that δ and ρ should be negative. Given that police salary scales are set nationally, and the salary scale for officers of a given rank are relatively short, there should be little spatial variation in the police wage and lnW_r^P should collapse to a constant. However, we test the sensitivity of our results to this assumption in Section 5.

We consider two further extensions of the model. The first is where we additionally control for a vector of individual characteristics, Z_i in the above equation. We interpret these measured characteristics (such as age, education and type of previous experience) as observable indicators of skill type, k, as in our economic model. Hence, whether applicant scores are associated with local wage conditions and the disamenity of policing then depends on the extent to which any previously identified relationship arises from attracting (or dissuading) applicants with certain observable characteristics that are associated with higher quality, as opposed to arising from attracting (or dissuading) applicants with unobservable quality.

The second extension is straightforward: we directly examine the likelihood that candidates with certain observable characteristics apply to the national assessment as a function of spatial variation in the outside wage and the disamenity of policing. Since there is considerable spatial variation in the characteristics of applicants, this specification provides further evidence on the determinants of the quality of applicants.

4.1. The quality of police applicants

Our measure of the quality of police officers is applicants' scores from the SEARCH national assessment. For candidates who undertook the SEARCH assessment between 2007 and 2010 we know which police force put them forward for assessment, and have data on their overall score, and their scores for three particular competency areas: oral communication, written communication and respect for race and diversity (RfRD). We also have data on characteristics of the candidates (age, education, ethnicity, previous employment, prior experience in the police). We use these both to explore the relationship between observable characteristics and applicant quality, and

to examine the channels through which spatial variation in relative wages and the disutility of policing affect the average quality of candidates.

Due to the nature of the assessment, there are 10 possible scores for written communication, 16 for oral communication and 22 for RfRD (and thereby 124 possible overall scores).[6] Figure 2 illustrates the distribution of scores achieved by candidates in 2008 for each of the three competency areas on which we have disaggregated data, and the distribution of overall scores. In 2008 the required pass marks were 44% for written communication, 50% for oral communication, 50% for Respect for Race and Diversity and 50% overall.[7] It is notable that the test of oral communication provides little discriminatory power between candidates, and furthermore that very few candidates fail to achieve the required scores for oral communication or RfRD, even the though the latter exhibited a wider score variation. There is the greatest variation across candidates in scores for the written assessment, and in 2008 13% of candidates failed to achieve the 44% pass mark.

The scores achieved by candidates vary systematically with individuals' characteristics. The regression analysis presented in Table 2 illustrates the characteristics associated with higher scores for each competency area, and a higher probability of passing overall. On average women score more highly in all areas than men, those with greater levels of education score more highly than those with lower levels of education and those with previous experience as a Police Community Support Officer or Special Constable score more highly than those without such experience. Candidates of white ethnicity score somewhat higher in most areas than those of mixed white ethnicity, but higher across all areas than those of other ethnicities. Some of these results, as expected, indicate differences in human capital

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[6] There are nine exercises that make up the SEARCH assessment, and each competency area is assessed in one or more exercise. Each time a competency area is assessed candidates receive a score between 0 and 3. Their final score for each competency area is then the sum of these scores, divided by the total possible score for that area. Table 1 describes which competency areas were assessed in which exercises in 2008. For example, written communication is assessed three times, so candidates can receive 10 possible scores (0,1,2,3,4,5,6,7,8 or 9 out of 9).

[7] The pass marks were set at these levels in November 2007. Prior to this the pass marks had been 44% for written communication and 60% for oral communication, RfRD and overall. These pass marks may play an important role in signalling the quality of applicants that is expected by the police service. Winsor (HMSO, 2012) recommended an increase in pass marks, including those for written communication, but these have not been introduced at the time of writing.

across applicants, other results clearly reflect the applicant self-selection implicit in our theoretical model.

4.2. *Estimating police wages and outside wages*

While our empirical approach to wage variation has much in common with past studies that have explored the relationship between relative pay and workforce quality, our treatment of wages W_r^P and $W_{i,r}^O$ differs somewhat. Since we are measuring the quality of police *applicants*, many of whom are young adults at the start of their working lives, we typically do not observe an outside contemporaneous wage for these individuals.[8] Furthermore, it is not clear that it is necessarily starting salaries that motivate career choice, or whether applicants are more forward looking. We therefore suppose that applicants base their career choice on how wages in the police compare to the average wages of all employees in their local area, after controlling for employee demographic characteristics.

More formally, we estimate:

$$\ln W_{i,r} = X_i \beta + \sum_r \vartheta_r F_r + \eta_i$$

where $W_{i,r}$ is the wage received by an employee, X_i is a vector of individual characteristics and F_r is a set of police force area dummies. The estimated value of $\vartheta_{1,r}$ is an indicator of the local area r fixed effect on the average outside wage, which can be used for $ln W_{i,r}^O$ in our estimation of $S_{i,r}$ above. Note that since these coefficients are themselves estimated, we bootstrap the two-stage process in order to produce appropriate standard errors around our estimates in the second stage estimation of $S_{i,r}$.

We estimate ϑ_r in our baseline estimates using data from the Labour Force Survey (LFS). This is a quarterly household survey, with a rotating panel element in which households are interviewed for five successive quarters. The LFS data contain information on individuals' earnings (which is elicited in two of the five quarters), and demographic information on which we can condition wages. The data do not

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[8] In any event, we do not of course simultaneously observe an 'inside' and 'outside' wage for any individual. Identification strategies in the context of estimating public sector wage 'premia' or 'penalties' are discussed at some length in Disney and Gosling (2003).

contain identifiers for the police force area in which an individual lives, but do contain local area identifiers which can be roughly aggregated up to police force areas. We pool LFS data from 2005 to 2010, and estimate ϑ_r controlling for sex, age, age squared, education, ethnicity, interactions between the quadratic in age and education, and time dummies.

The distribution of estimated area fixed effects is illustrated in Figure 3, normalized by subtracting the unweighted mean of ϑ_r. Unsurprisingly, outside wages are estimated to be highest in London, and many of the surrounding police force areas (Hertfordshire, Surrey and Thames Valley). In contrast, outside wages are lowest in predominantly rural areas such as Dyfed Powys and Devon and Cornwall.

We cannot test the sensitivity of our results to the assumption that there is no spatial variation in average police wages (conditional on observable characteristics) using the LFS data, since the sample sizes of observed police officers is too small. However we can use an alternative data source, the Annual Survey of Hours and Earnings, to shed some light on this. ASHE is an employer survey that collects panel data on the earnings and hours worked of a 1 per cent sample of employees in Great Britain. Using pooled ASHE data from 2006 to 2009 we estimate both the previous equation for log wages, and the expanded equation:

$$\ln W_{i,r} = X_i\beta + \sum_r \vartheta_{1,r}F_r + \vartheta_2 P_i + \sum_r \vartheta_{3,r}F_r \times P_i + \eta_i$$

where $W_{i,r}$ is the wage received by an employee, X_i is a vector of individual characteristics, F_r is a set of police force area dummies, P_i is a dummy for whether the employee is a police officer, and $F_r \times P_i$ is a set of interaction terms. In both cases the individual characteristics controlled for are simply sex, age and age squared, since these are the only demographic characteristics available in the ASHE data. In Section 5 we test the sensitivity of our main results to the assumption that there is no spatial variation in the police wage by controlling for the relative wage $ln(W_{i,r}^P/W_{i,r}^O)$, using $\vartheta_{3,r}$, rather than just controlling for the outside wage $lnW_{i,r}^O$ using $\vartheta_{1,r}$.

4.3. Disamenity of policing

One of our main contributions in this paper is that we explore the relationship between relative pay and workforce quality while simultaneously allowing for spatial

variation in the disamenity of policing. The indicators of disamenity that we control for are the crime rate (number of reported crimes per 1000 population), and composition of reported crime (the proportion of crime accounted for by 11 encompassing categories: theft, criminal damage and arson, domestic burglary, non-domestic burglary, public order offences, shoplifting, vehicle crime, violence without injury, violence with injury and other). We anticipate that a higher crime rate, and a greater proportion of crime being accounted for by violence with or without injury, would imply a greater disamenity of policing than a lower crime rate and a greater proportion of crime being accounted for by 'softer' forms of crime.

These variables are constructed from data on reported crime published by the Home Office, and population figures collated by the Chartered Institute of Public Finance and Accountancy. The level and composition of reported crime vary annually, and the variables are lagged one year, on the basis that individuals' decision to apply to the police force is most likely affected by recent observation of the level and composition of crime.

4.4. Other controls

In all our specifications to estimate $S_{i,r}$ we include a dummy for London, since there is a cost of living adjustment made to the wage of police officers in London. We also include time dummies to control for time trends in the quality of the national workforce (or apparent quality, if over time candidates learn how to 'game' the assessment), and annual variation in the difficulty of the national assessment (the exact exercises involved typically change annually).

Other controls for local area characteristics are also important to reduce concerns that there are unobservable area characteristics that make it more likely that higher or lower quality individuals would apply to the police in a given area (i.e. selection effects). We include controls for the local unemployment rate, and the availability of skilled labour in the local area, as measured by the proportion of the local population aged 25-55 (inclusive) who have a degree, the proportion whose highest qualification is A-levels (or equivalent) and the proportion whose highest qualification is below GCSEs (or equivalent). These time-varying local area controls are estimated using the LFS.

The theoretical model presented in Section 3 also predicted that higher quality individuals would apply to the police in a given area if living costs were lower (since then a given wage premium for working in the police would result in a greater increase in purchasing power). A lack of suitable data means that we are unable to control for local area differences in the general level of prices (let alone the price of a basket of goods that police applicants may on average purchase). However, we can include as a control the local area average house price, as an indicator of spatial variation in the general level of prices. We construct a measure of police force area average house price using Land Registry data on median house prices by local authority area, and aggregating these to police force areas by weighting according to the geographical distribution of households in the LFS. It should however be noted that, insofar as house prices also capture spatial differences in local amenity values, the association between house prices and police quality cannot be signed *a priori*.[9]

5. Results

Table 3 describes the distribution of pass rates and average (mean) candidate scores across police forces and time. There is considerable variation in pass rates: on one quarter of occasions the annual pass rate was less than 70.8%, while on one quarter of occasions the annual pass rate was more than 83.7%. Underlying this, there is variation in the average scores achieved by a force's candidates for oral communication, written communication, respect for race and diversity, and overall. The largest variation in average scores achieved is for written communication, as might be expected given this was the competency area with the largest variation in scores across candidates (shown in Figure 2).

The demographic composition of candidates put forward for assessment also differs across forces, and this could drive some of the differences in the average scores achieved by candidates (given that, as described in Table 2, some individual characteristics are associated with higher scores). Variation in the composition of candidates is summarised in Table 3. There is relatively little variation in the average age of candidates put forward by forces. In contrast, the proportion of candidates who were men varies from less than 62.6% for one quarter of forces' annual submissions,

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[9] For a survey, see Gibbons and Machin (2008).

to over 71.1% for one quarter of forces' annual submissions. Notably in the vast majority of cases this proportion is over 50% (despite women performing better on average in assessment – see Table 2). There is also considerable heterogeneity across forces in the average educational qualifications of their candidates, and the proportion of their candidates who have prior experience as a Special Constable or Police Community Support Officer.

The question we seek to answer is whether this variation in the average quality of candidates across forces is associated with variation in the outside wage (estimates of which were illustrated in Figure 3) and/or variation in the spatial disamenity of policing. These are the two channels through which our basic model suggested that national wage setting could affect applicant quality.

We start in Table 4 by presenting estimates of the association between outside wages and applicant quality when we control for time, whether applicants were put forward by the London Metropolitan Police, the availability of skilled labour in the local area, the local unemployment rate, and local average house prices. In line with our model, a higher outside wage (and therefore a lower relative wage for policing given the nationally set police wage) is associated with applicants performing less well overall, and scoring less well for written communication and Respect for Race and Diversity. However, a higher outside wage is also associated with candidates on average scoring more highly for oral communication, despite the lack of variation in oral test scores (see Figure 2).

In terms of the other covariates that our simple theoretical model suggested may be associated with quality, the picture again varies by the particular measure of quality considered. A higher unemployment rate is associated with higher average performance for written communication, but lower average performance for Respect for Race and Diversity. Our theoretical model suggested that a greater rate of job-seeking of skilled workers would increase the average quality of applicants. However, it may be that the local unemployment rate does not adequately capture this, and that the composition of those who are unemployed is important and varies spatially. Our model also suggested that areas with a greater stock of higher quality workers should have higher quality applicants to the police. Our results suggest that a higher proportion of the local population with higher levels of qualification is positively

associated with average applicant for Respect for Race and Diversity, but is negatively associated with average scores for oral communication and written communication.

House prices are found to have a positive association with scores for written communication and Respect for Race and Diversity, and overall scores, but a negative association with oral communication. This result is perhaps surprising, since all else equal a higher local price level would mean that a given wage premium for working in the police would imply lower additional purchasing power, and therefore might be expected to have a negative impact on the quality of applicants. However, house prices are an imperfect measure of local differences in the cost of living, and, as mentioned previously, could be indicative of other aspects – for example, areas with higher house prices might be more pleasant, have lower crime rates and be easier to police, and so have a lower disamenity of policing than other areas.

Once we control for spatial (and time) variation in our anticipated indicators of the disutility of policing our results are strengthened in the predicted direction. This is illustrated in Table 5. We now find a larger negative association between outside wages and average applicant scores for written communication and respect for race and diversity, average overall scores, and the pass rate. There remains the unexpectedly positive association between outside wages and average scores for oral communication, however it is worth reiterating that there is the least variation in candidate scores (and in forces' average candidate score) for oral communication.

Turning to the association between applicant quality and the disamenity of policing itself, for all measures of quality the indicators of disamenity are jointly significant using standard F-tests. We find that a higher level of crime in the local area in the year prior to application is associated with lower average applicant scores for written communication and respect for race and diversity, lower average overall scores, and a lower pass rate. This would be consistent with our prior that a higher crime rate is a disamenity of policing that would (all else equal) deter higher quality individuals. Similarly, we find that a higher proportion of crime being accounted for by violent crime (with or without injury) is associated with lower quality applicants on all measures.

These results therefore provide broad empirical support for the main predictions of our simple model: applicant quality is negatively associated with higher outside wages (which, given a nationally set police wage, imply a lower relative wage for policing), and is negatively associated with the disamenity of policing (which also cannot be compensated for given the national wage structure).

Throughout this analysis we have assumed that police wages do not vary nationally, and therefore that spatial variation in the relative wage for the policing is completely reflected in spatial variation in the outside wage. In Table 6 we test the sensitivity of our results to this assumption. First, we illustrate how our results are affected by using as our measure of outside wages the fixed effects estimated from the ASHE data. Note that these differ from those estimated using the LFS (used throughout the rest of the analysis in this paper) not just because the data source is different, but also because with the ASHE data we can estimate the spatial variation in wages conditional on age and sex only. This yields results that are qualitatively similar, but quantitatively slightly smaller, than our main results.

Second, we illustrate how our results are affected by controlling for the local *relative wage* rather than just the outside wage. This addresses the potential concern that police wages, as opposed to scale rates, are not completely national – for example, that higher wages could be paid by forces 'over-promoting' its officers up the pay scale in areas where recruitment or retention is made more difficult by higher outside wages. The results are shown in the bottom panel of Table 6; note that we would now expect the sign on the relative wage to be opposite to the sign on the outside wage, since a higher outside wage implies a lower relative wage (for a given police wage). The results are broadly in line with those estimated just using the outside wage, suggesting that our main results are not affected by our assumption that (conditional) police wages do not vary spatially.

Finally, we turn to a brief discussion of how the association of quality with outside wages and the disamenity of policing manifests itself – in particular, whether it is driven by candidates with particular characteristics (observed skill types) being more or less likely to apply. Table 7 illustrates the impact on our headline results from Table 5 if we additionally control for candidate characteristics (age, sex, education, ethnicity and previous experience as a Special Constable or a Police Community

Support Officer). Doing so reduces the magnitude of the associations between quality and outside wages, and quality and disamenity, but does not eliminate them. This suggests that part of the effect of national wages is to influence the composition of applicants in terms of their observable characteristics, but in large part the effect comes through differences in unobservable quality of candidates.

Table 8 presents the results of regressions that explore the association of candidate characteristics (mean age, and the probability of being female, having A-levels or higher qualifications, being of white ethnicity, and having previous policing experience) with outside wages and the disamenity of policing. These suggest that higher outside wages (i.e. a lower relative wage for policing) are associated with a lower average age, and a smaller proportion of applicants who are female and who are of white ethnicity. These are all characteristics that are associated with higher test scores (see Table 2). There is little association between the outside wage and the probability that an applicant has previous policing experience. However, variation in the prevalence of previous experience among applicants is likely to be driven by different forces' decisions regarding the role of Special Constables and Police Community Support Officers in their workforce, rather than a selection effect of whether individuals with such experience go on to apply to be police officers. There is also little association between broad measures of the educational qualifications of candidates and outside wages. This may reflect selection issues. In terms of the impact of the disamenity of policing on candidate characteristics, perhaps surprisingly we do not find that a high proportion of violent crime is association with a lower proportion of female applicants. However, we do find that it is associated with a lower proportion of white applicants, and a lower proportion of applicants with higher qualifications.[10]

6. Conclusions

In this paper we have used a novel dataset to analyse the impact of centrally regulated pay on the quality of applicants to the police in England and Wales. This data –

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[10] An interesting question is whether the nature of policing is endogenous to types of crime – for example, as to whether police are armed (which is not automatic in the UK) and in the nature of patrolling: see Southwick (1998) for a discussion in the US context. However we would not expect applicants to be aware of these differences across police forces.

individual test scores from the national assessment required of all applicants – provides a direct measure of 'quality' pertinent to the occupation in question, are therefore represents an improvement over the existing literature that has relied on inference from prior schooling or institutional performance.

We provide empirical evidence of two distinct channels through which centrally regulated pay affects workforce quality. First, central wage setting implies relative wages between the police and other occupations vary spatially and we demonstrate that higher outside wages is associated with lower quality applicants (as measured by their test scores). Second, national police wages cannot adjust to reflect spatial variation in the disamenity of policing, and we demonstrate that a greater disamenity of policing (as measured by crime rates and the proportion of crime that is violence) is also associated with lower quality police applicants. For the most part these impacts on applicant quality are not explained by an effect on the composition of applicants in terms of observable characteristics. However, higher outside wages do appear to slightly deter applications from women, older individuals, white individuals and those with higher levels of education (all characteristics that are positively associated with test performance), while higher disamenity of policing appears to deter older applicants and those with higher levels of qualifications.

In the context of the police in England and Wales, the impacts on quality of spatial variation in relative wages and spatial variation in the disamenity of policing offset each other somewhat: the association between outside wages and quality is weaker when disamenity is not separately controlled for. Whether this arises because the higher relative wage in some areas directly compensates those who would otherwise be put off by the greater disamenity of policing in those areas, or whether there are different 'types' of people – those who respond to monetary incentives and those who respond to non-monetary aspects of the job – is a topic for further research. However, what is clear is that studies that analyse the impact of national wages on workforce quality by considering only spatial variation in the relative wage potentially miss an important part of the picture. Spatial variation in the disamenity of an occupation, which cannot be reflected in local wages, may also be important, and in other settings may not have an offsetting effect on the impact of wage differentials on workforce quality.

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Tables and figures

Figure 1: Average position of police officers in the local hourly wage distribution of full-time employees
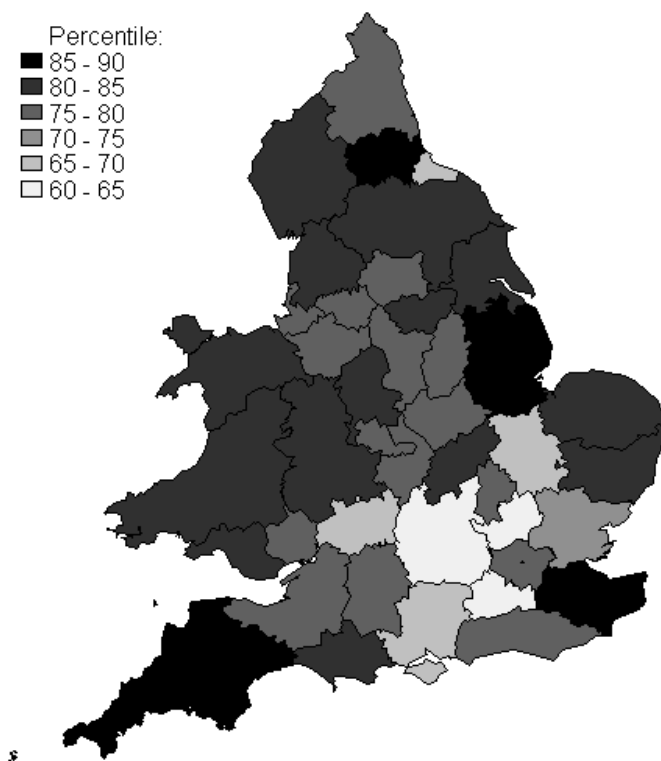
Table 1: Matrix of competency areas assessed by exercise, 2008

| | | Exercises | | | | | | | Psychometric Tests | |
| | | Interactive | | | | Written | | | | |
		1	2	3	4	1	2	Interview	Verbal logical reasoning	Numerical reasoning
Competency areas	Community & Customer Focus	✓	✓		✓	✓	✓			
	Effective Communication	✓			✓	✓				
	Oral Communication	✓	✓	✓	✓			✓		
	Written Communication					✓	✓		✓	
	Personal Responsibility		✓	✓	✓					
	Problem Solving	✓		✓	✓	✓	✓	✓		✓
	Resilience		✓	✓				✓		
	Respect for Race & Diversity	✓	✓	✓	✓	✓	✓	✓		
	Teamworking	✓	✓	✓			✓	✓		

2: Distribution of candidate test scores, 2008
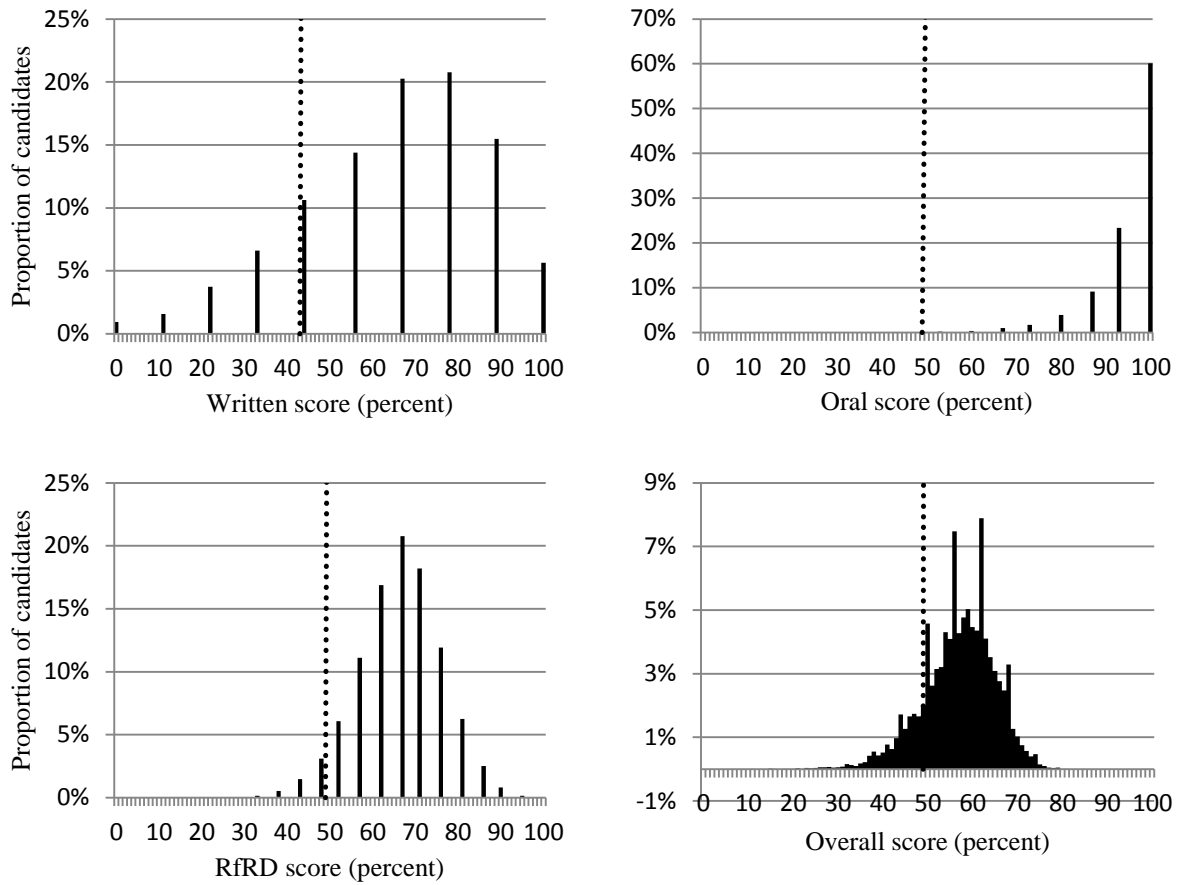
Notes: In 2008 the required marks to pass the SEARCH assessment were 44% for written communication, 50% for oral communication, 50% for Respect for Race and Diversity and 50% overall.

Figure 3. Distribution of police force area fixed effects on outside wages
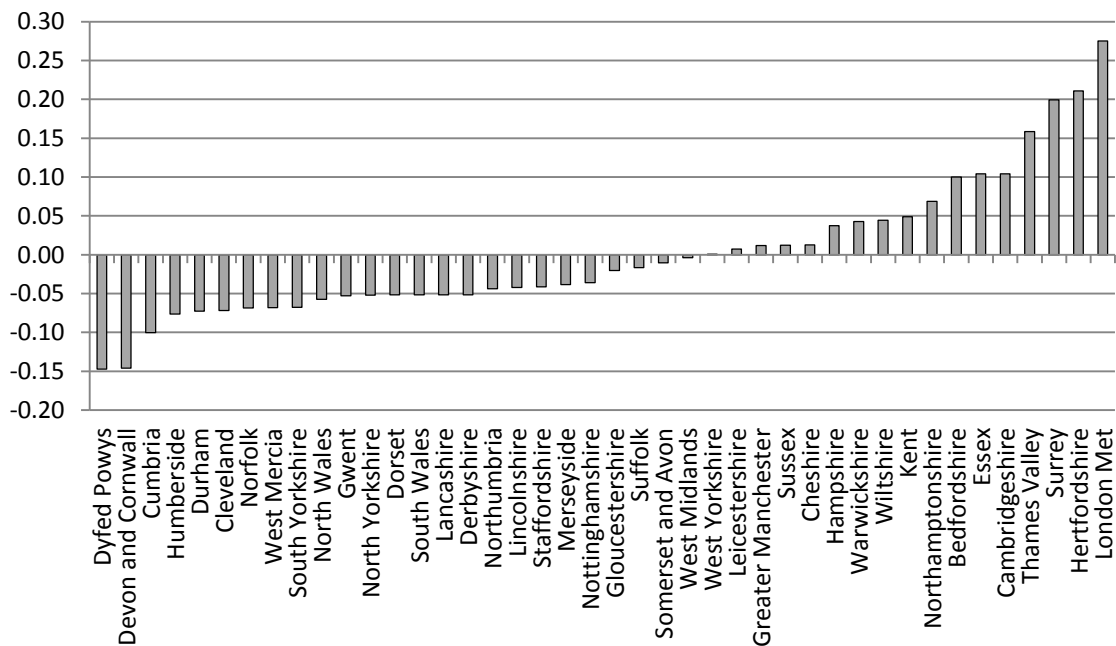
Table 2: Characteristics associated with candidates' test scores

|	Written score	Oral score	RFD score	Overall score	Pr(pass)
2008	-3.858	-0.248	0.433	-0.635	-0.036
	(8.64)**	(1.72)	(2.36)*	(4.20)**	(3.95)**
2009	-11.381	1.082	1.332	-2.822	-0.124
	(25.32)**	(7.48)**	(7.21)**	(18.52)**	(13.66)**
2010	-1.931	1.576	-0.171	0.566	0.010
	(3.48)**	(8.82)**	(0.75)	(3.01)**	(0.88)
Age	1.224	0.558	1.045	0.930	0.038
	(10.47)**	(14.84)**	(21.79)**	(23.49)**	(15.98)**
Age squared	-0.019	-0.009	-0.016	-0.014	-0.001
	(9.82)**	(14.66)**	(20.50)**	(22.42)**	(15.31)**
Male	-2.434	-1.014	-2.255	-1.820	-0.062
	(10.77)**	(13.93)**	(24.30)**	(23.75)**	(13.58)**
GCSEs	1.840	1.082	0.176	0.371	0.012
	(3.48)**	(6.36)**	(0.81)	(2.07)*	(1.11)
A levels	5.933	1.736	1.813	2.397	0.098
	(11.24)**	(10.22)**	(8.36)**	(13.40)**	(9.19)**
Graduate	9.767	2.381	3.303	4.491	0.168
	(18.22)**	(13.80)**	(15.00)**	(24.71)**	(15.55)**
Experience: PCSO	2.685	2.006	3.902	4.003	0.132
	(9.12)**	(21.17)**	(32.29)**	(40.11)**	(22.29)**
Experience: SC	3.120	1.473	2.682	2.860	0.092
	(8.30)**	(12.17)**	(17.38)**	(22.45)**	(12.18)**
Mixed white	-3.395	-0.161	0.139	-0.512	-0.031
	(5.17)**	(0.76)	(0.51)	(2.30)*	(2.35)*
Asian	-15.309	-2.801	-2.190	-3.793	-0.209
	(32.84)**	(18.67)**	(11.44)**	(24.00)**	(22.24)**
African	-19.627	-4.656	-1.827	-5.436	-0.288
	(27.93)**	(20.59)**	(6.33)**	(22.82)**	(20.33)**
Chinese	-10.194	-3.974	-1.614	-2.433	-0.103
	(5.63)**	(6.82)**	(2.17)*	(3.97)**	(2.83)**
Other	-19.962	-5.271	-2.486	-5.903	-0.269
	(13.17)**	(10.80)**	(3.99)**	(11.49)**	(8.82)**
Missing ethnicity	-3.939	-0.702	-1.012	-1.126	-0.053
	(9.12)**	(5.05)**	(5.71)**	(7.69)**	(6.14)**
Constant	47.661	86.282	49.329	42.231	0.176
	(25.94)**	(145.90)**	(65.39)**	(67.80)**	(4.75)**
R-squared	0.11	0.06	0.08	0.16	0.08

Notes: Sample size is 41,485 individuals. Figures are marginal effects from linear regression (first four columns) and linear probability model (final column). Baseline candidate is female, with no qualifications, no previous experience in the police, and of white ethnicity. Standard errors are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level respectively.

Table 3. Distribution of average candidate performance, candidate composition, local area characteristics, and the disamenity of policing across forces and time

	Mean	Standard deviation	25th percentile	Median	75th percentile
Candidate performance					
Pass rate	75.6	14.857	70.8	77.5	83.7
Mean score:					
Written communication	64.8	8.478	60.3	66.1	69.5
Oral communication	95.8	2.177	94.9	96.0	97.2
Respect for Race and Diversity	66.7	4.234	64.9	67.0	68.5
Overall	57.3	2.876	55.4	57.3	59.0
Candidate characteristics					
Mean age	26.6	2.057	25.9	26.7	27.3
% male	68.0	11.109	62.6	66.7	71.1
% with only A-levels	38.8	14.790	34.5	39.2	43.3
% with degree	27.8	16.402	21.2	28.1	32.1
% with experience	27.0	18.841	17.1	25.0	33.0
% white	86.0	15.533	82.9	90.8	94.6
Local area characteristics					
% of population with degree	33.6	9.489	28.3	31.1	36.9
% of population with only A-levels	20.1	3.421	19.3	20.6	21.9
% of population with only GCSEs	22.8	4.201	21.6	23.6	25.4
Unemployment rate (%)	4.3	2.072	3.0	4.0	4.9
Median house price (£,000s)	158.1	52.607	119.3	145.0	175.0
Disamenity of policing					
Crime per 1000 population	7.3	1.759	6.2	7.2	8.3
% crime: theft	17.5	4.441	15.7	16.9	18.4
% crime: criminal damage	22.0	4.384	20.5	22.4	24.6
% crime: domestic burglary	5.2	1.677	4.2	5.2	6.3
% crime: drugs offences	4.4	2.260	3.2	3.9	4.5
% crime: non-domestic burglary	6.7	1.055	6.1	6.6	7.4
% crime: public order offences	4.4	1.185	3.5	4.2	5.1
% crime: shoplifting	6.9	1.501	5.9	6.9	7.8
% crime: vehicle offences	12.2	2.811	10.6	12.2	14.2
% crime: violence without injury	9.9	1.752	8.8	9.7	11.0
% crime: violence with injury	1.1	0.856	0.6	0.8	1.3

Notes: Distributions are calculated over 133 force-time observations (42 forces, observed between once and four times).

Table 4. Association of applicant quality with outside wage

	Written communication (%)	Oral communication (%)	Respect for Race and Diversity (%)	Overall (%)	Pr.(Pass)
$LnW^O (= \vartheta_r)$	-11.104	11.752	-9.087	-9.539	-0.116
	(2.824)***	(0.924)***	(1.350)***	(1.029)***	(0.060)*
2008	-2.725	-0.069	0.815	-0.246	-0.018
	(0.446)***	(0.159)	(0.217)***	(0.160)	(0.009)*
2009	-10.612	1.185	1.983	-2.210	-0.100
	(0.517)***	(0.178)***	(0.242)***	(0.191)***	(0.011)***
2010	-2.495	2.195	0.327	1.124	0.038
	(0.620)***	(0.201)***	(0.274)	(0.228)***	(0.013)***
London	-0.663	-0.899	-0.116	-0.877	-0.018
	(0.761)	(0.249)***	(0.338)	(0.278)***	(0.015)
% with degree	-0.312	-0.050	0.076	0.005	-0.003
	(0.063)***	(0.018)**	(0.028)***	(0.022)	(0.001)**
% with A-levels	-0.228	-0.024	0.123	0.023	-0.001
	(0.120)*	(0.038)	(0.057)**	(0.044)	(0.003)
% with no qualifications	-0.596	-0.038	0.011	-0.020	-0.004
	(0.076)***	(0.022)	(0.034)	(0.027)	(0.002)**
Unemployment rate	0.297	-0.052	-0.125	0.017	-0.001
	(0.094)***	(0.024)	(0.038)***	(0.031)	(0.002)
Av. house price (£,000s)	0.028	-0.012	0.019	0.028	0.001
	(0.008)***	(0.002)***	(0.004)***	(0.003)***	(0.000)***
R-Squared	0.05	0.02	0.01	0.04	0.02
F(10,41474)	228.17	71.62	40.11	153.65	70.90

Notes: Sample size is 41,485. Bootstrapped standard errors, 999 replications.

Table 5. Association of applicant quality with outside wage; controlling for disutility of policing

	Written communication (%)	Oral communication (%)	Respect for Race and Diversity (%)	Overall (%)	Pr.(Pass)
$LnW^O(=\vartheta_r)$	-21.294	9.388	-18.659	-13.196	-0.310
	(3.838)***	(1.286)***	(1.844)***	(1.409)***	(0.080)***
2008	-3.355	-0.343	0.320	-1.136	-0.060
	(0.565)***	(0.186)*	(0.256)	(0.204)***	(0.011)***
2009	-10.988	0.115	0.430	-4.216	-0.187
	(0.823)***	(0.285)	(0.381)	(0.306)***	(0.017)***
2010	-2.288	0.787	-1.133	-1.166	-0.055
	(0.986)**	(0.331)**	(0.445)***	(0.360)***	(0.020)***
London	2.302	-0.997	5.110	3.541	0.171
	(1.369)	(0.458)**	(0.625)***	(0.485)***	(0.029)***
% with degree	-0.317	-0.046	0.049	0.070	-0.001
	(0.078)***	(0.023)*	(0.036)	(0.028)**	(0.002)
% with A-levels	-0.419	0.071	-0.028	0.096	0.001
	(0.147)***	(0.047)	(0.071)	(0.057)*	(0.003)
% with no qualifications	-0.403	-0.095	0.012	0.082	-0.000
	(0.106)***	(0.030)***	(0.046)	(0.038)**	(0.002)
Unemployment rate	0.422	0.084	0.395	0.330	0.012
	(0.159)***	(0.048)*	(0.068)***	(0.053)***	(0.003)***
Av. house price (£,000s)	0.051	-0.014	0.025	0.032	0.001
	(0.012)***	(0.004)***	(0.005)***	(0.004)***	(0.000)**
Proportion of crime:					
Theft	0.496	-0.384	-0.177	-0.156	-0.005
	(0.167)***	(0.057)***	(0.079)**	(0.060)**	(0.003)
Criminal damage	0.429	-0.399	-0.234	-0.149	-0.006
	(0.156)**	(0.057)***	(0.072)***	(0.058)**	(0.003)*
Domestic burglary	1.343	-0.078	0.488	0.638	0.026
	(0.245)***	(0.074)	(0.109)***	(0.089)***	(0.005)***
Drugs offences	0.090	-0.058	-0.410	-0.105	-0.005
	(0.162)	(0.051)	(0.072)***	(0.060)*	(0.003)
Non-dom. burglary	-0.536	0.248	-0.361	0.044	-0.003
	(0.287)*	(0.090)**	(0.127)***	(0.106)	(0.006)
Public order offences	-0.116	-0.441	-0.023	-0.170	-0.009
	(0.215)	(0.072)***	(0.100)	(0.078)**	(0.004)**
Shoplifting	0.166	-0.400	-0.177	0.017	-0.004
	(0.231)	(0.077)***	(0.106)*	(0.086)	(0.005)
Vehicle offences	0.384	-0.304	0.172	0.056	0.004
	(0.151)**	(0.051)***	(0.070)***	(0.058)	(0.003)
Violence without injury	0.067	-0.365	-0.406	-0.088	-0.008
	(0.204)	(0.070)***	(0.094)***	(0.075)	(0.004)*
Violence with injury	-1.846	-0.410	-2.069	-1.822	-0.072
	(0.356)***	(0.120)***	(0.165)***	(0.128)***	(0.008)***
Crime per 1000 head	-0.554	0.103	-0.435	-0.394	-0.023
	(0.214)**	(0.068)	(0.096)***	(0.081)***	(0.004)***
R-squared	0.06	0.02	0.02	0.04	0.02
F(21,41463)	115.63	45.83	37.05	90.67	43.68

Notes: Sample size is 41,485. Standard errors are bootstrapped, 999 replications.

Table 6. Sensitivity analysis

	Written communication (%)	Oral communication (%)	Respect for Race and Diversity (%)	Overall (%)	Pr.(Pass)
Baseline (LFS, all)					
$LnW^O(=\vartheta_r)$	-21.294	9.388	-18.659	-13.196	-0.310
	(3.838)***	(1.286)***	(1.844)***	(1.409)***	(0.080)***
Violence without injury	0.067	-0.365	-0.406	-0.088	-0.008
	(0.204)	(0.070)***	(0.094)***	(0.075)	(0.004)*
Violence with injury	-1.846	-0.410	-2.069	-1.822	-0.072
	(0.356)***	(0.120)***	(0.165)***	(0.128)***	(0.008)***
Crime per 1000 head	-0.554	0.103	-0.435	-0.394	-0.023
	(0.214)**	(0.068)	(0.096)***	(0.081)***	(0.004)***
R-squared	0.06	0.02	0.02	0.04	0.02
ASHE, excl. police wage					
$LnW^O(=\vartheta_{1,r})$	-14.404	5.777	-15.762	-8.595	-0.189
	(4.938)***	(1.576)***	(2.036)***	(1.735)***	(0.100)*
Violence without injury	0.324	-0.477	-0.176	0.070	-0.004
	(0.209)	(0.067)***	(0.086)**	(0.073)	(0.004)
Violence with injury	-1.602	-0.514	-1.838	-1.673	-0.068
	(0.377)***	(0.120)***	(0.156)***	(0.133)***	(0.008)***
Crime per 1000 head	-0.160	-0.063	-0.051	-0.154	-0.018
	(0.223)	(0.071)	(0.092)	(0.079)*	(0.005)***
R-squared	0.05	0.02	0.02	0.04	0.02
ASHE, incl. police wage					
$Ln(W^P/W^O)(=\vartheta_{3,r})$	16.182	-1.918	11.159	6.525	0.273
	(2.680)***	(0.856)**	(1.105)***	(0.941)***	(0.054)***
Violence without injury	0.442	-0.485	-0.103	0.114	-0.002
	(0.210)**	(0.067)***	(0.087)	(0.074)	(0.004)
Violence with injury	-1.915	-0.454	-2.087	-1.815	-0.073
	(0.378)***	(0.121)***	(0.156)***	(0.133)***	(0.008)***
Crime per 1000 head	0.046	-0.037	0.020	-0.105	-0.014
	(0.224)	(0.072)	(0.092)	(0.079)	(0.005)***
R-squared	0.06	0.02	0.02	0.04	0.02

Notes: Sample size is 41,485. All regressions are the same specification as presented in Table 5. For brevity only a limited number of coefficients are reported here; full results are available on request. Standard errors in the baseline regression are bootstrapped, 999 replications.

Table 7. Association of applicant quality with outside wage; controlling for applicant characteristics

	Written communication (%)	Oral communication (%)	Respect for Race and Diversity (%)	Overall (%)	Pr.(Pass)
Without controls for applicant characteristics:					
$LnW^O (= \vartheta_r)$	-21.294	9.388	-18.659	-13.196	-0.310
	(3.838)***	(1.286)***	(1.844)***	(1.409)***	(0.080)***
Violence without injury	0.067	-0.365	-0.406	-0.088	-0.008
	(0.204)	(0.070)***	(0.094)***	(0.075)	(0.004)*
Violence with injury	-1.846	-0.410	-2.069	-1.822	-0.072
	(0.356)***	(0.120)***	(0.165)***	(0.128)***	(0.008)***
Crime per 1000 head	-0.554	0.103	-0.435	-0.394	-0.023
	(0.214)**	(0.068)	(0.096)***	(0.081)***	(0.004)***
R-squared	0.06	0.02	0.02	0.04	0.02
With controls for applicant characteristics					
$LnW^O (= \vartheta_r)$	-14.371	11.545	-15.364	-9.581	-0.162
	(3.697)***	(1.273)***	(1.777)***	(1.360)***	(0.079)**
Violence without injury	0.131	-0.365	-0.400	-0.070	-0.007
	(0.199)	(0.068)***	(0.091)***	(0.070)	(0.004)*
Violence with injury	-0.761	-0.089	-1.562	-1.212	-0.048
	(0.345)**	(0.117)	(0.159)***	(0.119)***	(0.007)***
Crime per 1000 head	-0.568	0.099	-0.439	-0.401	-0.024
	(0.207)***	(0.067)	(0.092)***	(0.077)***	(0.004)***
R-squared	0.12	0.08	0.09	0.17	0.08

Notes: Sample size is 41.485. Standard errors are bootstrapped, 999 replications.

Table 8. Association of applicant characteristics with outside wage and disamenity of policing

	Age	Pr(Female)	Pr(Experience)	Pr(A-levels or above)	Pr(White)
$LnW^O (= \vartheta_r)$	-7.030	-0.302	-0.145	-0.135	-0.232
	(1.221)***	(0.093)***	(0.086)*	(0.087)	(0.058)***
2008	0.166	0.004	0.048	-0.016	0.017
	(0.168)	(0.012)	(0.011)***	(0.012)	(0.010)*
2009	0.789	-0.004	0.067	-0.103	0.012
	(0.261)***	(0.019)	(0.017)***	(0.019)***	(0.014)
2010	0.952	0.022	0.122	-0.099	-0.014
	(0.314)***	(0.023)	(0.021)***	(0.022)***	(0.017)
London	1.420	0.002	0.142	0.231	0.026
	(0.418)***	(0.031)	(0.028)***	(0.031)***	(0.022)
% with degree	0.060	0.001	-0.001	0.005	0.001
	(0.022)**	(0.001)	(0.002)	(0.002)***	(0.001)
% with A-levels	0.030	-0.003	-0.009	0.012	0.002
	(0.044)	(0.003)	(0.003)***	(0.003)***	(0.002)
% with no qualifications	0.080	-0.001	0.003	0.001	0.004
	(0.030)**	(0.002)	(0.002)	(0.002)	(0.002)**
Unemployment rate	-0.032	0.002	0.007	0.010	0.005
	(0.047)	(0.003)	(0.003)**	(0.003)***	(0.002)*
Av. house price (£,000s)	0.013	0.001	0.001	-0.001	0.000
	(0.004)***	(0.000)**	(0.000)**	(0.000)***	(0.001)
Proportion of crime:					
Theft	0.191	-0.002	0.007	-0.016	-0.005
	(0.052)***	(0.004)	(0.004)**	(0.004)***	(0.003)*
Criminal damage	0.116	0.006	0.005	-0.026	-0.008
	(0.051)**	(0.004)	(0.003)	(0.004)***	(0.003)***
Domestic burglary	0.086	0.008	0.011	-0.010	0.002
	(0.071)	(0.006)	(0.005)**	(0.006)*	(0.004)
Drugs offences	-0.004	-0.002	-0.009	-0.000	0.000
	(0.048)	(0.004)	(0.003)***	(0.003)	(0.002)
Non-dom. burglary	0.209	-0.013	0.006	0.023	0.013
	(0.086)**	(0.007)**	(0.006)	(0.006)***	(0.005)**
Public order offences	0.268	-0.007	-0.000	-0.004	-0.003
	(0.067)***	(0.005)	(0.005)	(0.005)	(0.003)
Shoplifting	0.128	-0.003	-0.008	-0.003	0.006
	(0.069)*	(0.005)	(0.005)	(0.005)	(0.003)
Vehicle offences	0.087	0.002	0.000	-0.002	-0.003
	(0.044)*	(0.003)	(0.003)	(0.003)	(0.002)
Violence without injury	0.145	0.006	0.002	-0.016	-0.011
	(0.061)**	(0.005)	(0.004)	(0.005)***	(0.003)***
Violence with injury	-0.017	-0.009	-0.054	-0.084	-0.067
	(0.108)	(0.008)	(0.007)***	(0.008)***	(0.006)***
Crime per 1000 head	0.024	-0.002	-0.002	-0.003	0.002
	(0.061)	(0.005)	(0.004)	(0.005)	(0.003)
R-squared	0.01	0.01	0.01	0.01	0.05
F(21,41463)	16.07	6.58	26.70	19.11	103.67

Notes: Sample size is 41,485. Standard errors are bootstrapped, 999 replications.