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Racial wage discrimination in SA before and after the first democratic election

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1. Introduction

Several studies focusing on racial discrimination in the South African labour market have been conducted. Different approaches have been used, but the major findings have been similar. Knight and McGrath (1987) found that discrimination against Africans (blacks) decreased by 50 per cent between 1976 and 1985. Work done by Moll (1998) and Hinks (1999) using data from 1980 and 1993, and 1980 and 1994, respectively, also led to the conclusion that racial wage discrimination was declining in South Africa. However, discrimination studies using post-apartheid data cannot confirm that the previous decline in discrimination is continuing. Based on data from 1995 and 1997 Hinks and Allanson (2000) found discriminatory patterns varied between racial groups.

The present paper focuses on wage discrimination for full-time employees. Such discrimination is estimated by decomposing differences in mean wages between South Africa's four racial groups, into a productivity component and a discrimination component. Following this approach, discrimination is defined as unequal pay for similar work. Other discrimination devices, such as occupational barriers to groups and the differing quality of education, are thus not the primary concern of the work to follow. However, the procedure controls for the occupational distribution using dummy variables. Measuring quality of education differences is more complicated, and information potentially indicative of educational quality was unavailable in the data used. What may be called pre-labour market discrimination is then at best controlled for, and our attention is confined to discrimination among groups already within the labour market. Having said this, wage discrimination should not be interpreted as workers of different races having the same occupation, identical jobs and working for the same employer, but being paid at different rates. Discrimination rather reflects different pay to workers falling under the same occupational categories, working for different employers, etc.

The empirical work is based on data from 1993 and 1995, that is, data collected just before and just after the fall of apartheid. It is hoped that thereby additional insight into changes in discrimination and its magnitude may be forthcoming.

Section 2 of the paper provides a review of major developments in the methodology of estimating discrimination based on wage differentials. The starting point is Oaxaca's (1973) decomposition of a wage differential into a productivity component and a discriminatory component. Possible estimation methods of various wage decompositions are also discussed. Next, it is shown how different wage decompositions link to discrimination theory in general. More specifically, how wage decompositions relate to employer discrimination is illuminated in the Becker (1971) tradition. In Section 3, the specification of the earnings functions, which enable estimation of discrimination, is motivated. Finally, results are presented and conclusions drawn.

2. Review of the Wage Differential Methodology

2.1 Decomposition theory

Economic research into wage discrimination has focused on decomposing wage differentials into two components, namely a productivity component and a discrimination component. Since Oaxaca's (1973) pioneering study of gender discrimination in the United States labour market, the methodology concerning discrimination based on wage differences has evolved considerably. A review of the main developments in handling decomposition between two groups, and also how researchers have dealt with multilateral comparisons, is given below. In the literature,

explanations on how to derive the desired decomposition equation are generally rather brief. This review will be more thorough in attempting to make it easier to follow the various steps of the mathematical derivations. The original contributors to the methodology included Oaxaca (1973), Neumark (1988), Cotton (1988), Oaxaca and Ransom (1988 and 1994) and Hinks (1999).

2.1.1 The gross (unadjusted) wage differential

The observed or actual wage differential G is defined as

$$G_{kl} = \frac{\bar{W}_k - \bar{W}_l}{\bar{W}_l} \Leftrightarrow G_{kl} + 1 = \frac{\bar{W}_k}{\bar{W}_l}, \quad (1)$$

where k and l represent groups or categories within a chosen qualitative variable (e.g. racial groups, genders, union members versus non-union members, etc.), $\bar{W}_{k,l}$ are the mean current wages of the two groups, and G gives the relative difference between the mean wages of groups k and l .

Applying a logarithmic transformation to (1) one obtains

$$\ln(G_{kl} + 1) = \ln\left(\frac{\bar{W}_k}{\bar{W}_l}\right) = \ln(\bar{W}_k) - \ln(\bar{W}_l). \quad (2)$$

Note that $\ln(\bar{W}_k)$ represents the (geometric) mean wage for group k . This format is particularly useful given the standard semi-logarithmic form of the earnings function regression equation.

2.1.2 The productivity differential

Assuming that a unit of labour was paid its marginal productivity in the absence of discrimination we have:

$$\bar{W}_k^0 = \overline{MP}_k \quad \text{and} \quad (3a)$$

$$\bar{W}_l^0 = \overline{MP}_l \quad (3b)$$

where the superscript 0 refers to the absence of discrimination. This allows us to define the productivity differential interchangeably as

$$Q_{kl} = \frac{\overline{MP}_k - \overline{MP}_l}{\overline{MP}_l} \Leftrightarrow Q_{kl} + 1 = \left(\frac{\bar{W}_k^0}{\bar{W}_l^0}\right). \quad (4)$$

Again, subscripts refer to groups, while Q measures the relative difference between mean wages of different groups if employees were paid the non-discriminatory wage. In other words, Q represents the hypothetical earnings differential attributable solely to differences in (mean) productivity between the groups k and l .

In logarithmic form (4) becomes

$$\ln(Q_{kl} + 1) = \ln\left(\frac{\bar{W}_k}{\bar{W}_l}\right) = \ln(\bar{W}_k^0) - \ln(\bar{W}_l^0). \quad (5)$$

2.1.3 The market discrimination coefficient

Given the gross wage differential and the productivity differential we can derive the market discrimination coefficient as the relative difference between the actual mean wage difference and the mean wage difference in the absence of discrimination:

$$D_{kl} = \left(\frac{\bar{W}_k/\bar{W}_l - \bar{W}_k^0/\bar{W}_l^0}{\bar{W}_k^0/\bar{W}_l^0}\right) \Leftrightarrow D_{kl} + 1 = \left(\frac{\bar{W}_k/\bar{W}_l}{\bar{W}_k^0/\bar{W}_l^0}\right). \quad (6)$$

In logarithmic form (6) becomes

$$\ln(D_{kl} + 1) = \ln\left(\frac{\bar{W}_k/\bar{W}_l}{\bar{W}_k^0/\bar{W}_l^0}\right) = \ln\left(\frac{\bar{W}_k}{\bar{W}_l}\right) - \ln\left(\frac{\bar{W}_k^0}{\bar{W}_l^0}\right). \quad (7)$$

Inserting (2) and (5) into (7) and rearranging we obtain

$$\ln(G_{kl} + 1) = \ln(Q_{kl} + 1) + \ln(D_{kl} + 1). \quad (8)$$

We have here the traditional decomposition of the logarithmic mean wage differential into a productivity component ($\ln(Q_{kl} + 1)$) and a discrimination component ($\ln(D_{kl} + 1)$) (Oaxaca and Ransom 1994). According to this decomposition, discrimination takes the form of one group being either over- or underpaid. Assume group k is overpaid. Group l now has nothing to gain from discrimination vanishing, since the absence of discrimination implies reduced wages for group k but the same wages for group l. Assume instead that discrimination materialises in group l being underpaid. In the absence of discrimination, group l wages would increase. Group k wages would remain unchanged, since discrimination defined by equation (8) restricts discrimination to over- or to underpayment, not to both (Cotton 1998). In both scenarios only one group is affected if discrimination should disappear. Moving from one state to another (i.e. discrimination to no discrimination or vice versa) would involve a change in the size of the total wage bill (and in the share of output captured by capital if the output level remained constant). Discrimination defined solely as over- or underpayment, originally used by Oaxaca (1973), has more recently been recognised as overly restrictive.

To argue that both groups would be affected by the removal of discrimination leads to a further decomposition of equation (8). Discrimination can now be attributed to both over- and underpayments, relative to non-discriminatory wage payments. One group receives above the non-discriminatory wage, benefiting from the other group being paid less than the non-discriminatory wage.

From (7) we have

$$\begin{aligned} \ln(D_{kl} + 1) &= \ln\left(\frac{\bar{W}_k}{\bar{W}_l}\right) - \ln\left(\frac{\bar{W}_k^0}{\bar{W}_l^0}\right) \\ &= (\ln \bar{W}_k - \ln \bar{W}_l) - (\ln \bar{W}_k^0 - \ln \bar{W}_l^0) \\ &= \ln\left(\frac{\bar{W}_k}{\bar{W}_k^0}\right) - \ln\left(\frac{\bar{W}_l}{\bar{W}_l^0}\right). \end{aligned}$$

Therefore we can write

$$\ln(D_{kl} + 1) = \ln(\mathbf{d}_k + 1) - \ln(\mathbf{d}_l + 1), \quad (9)$$

where

$$\mathbf{d}_i = \frac{\bar{W}_i}{\bar{W}_i^0} - 1 \quad i = k, l. \quad (10)$$

\mathbf{d}_i is the differential between the current mean wage of group i , and the mean wage of the *same* group in the absence of discrimination. If $\mathbf{d}_i \geq 0$ then $\ln(\mathbf{d}_i + 1)$ can be interpreted as the group i wage advantage. If $\mathbf{d}_i \leq 0$ then $\ln(\mathbf{d}_i + 1)$ is interpreted as the group i wage disadvantage. From (9) we see that discrimination can be separated into a wage advantage ($\ln(\mathbf{d}_i + 1)$, when $\mathbf{d}_i \geq 0$) and a wage disadvantage ($\ln(\mathbf{d}_i + 1)$, when $\mathbf{d}_i \leq 0$).¹

Inserting (9) into (8) yields

$$\ln(G_{kl} + 1) = \ln(Q_{kl} + 1) + [\ln(\mathbf{d}_k + 1) - \ln(\mathbf{d}_l + 1)]. \quad (11)$$

Equation (11) gives an expanded decomposition where the discrimination component is broken down into overpayment ($\ln(\mathbf{d}_k + 1)$) and underpayment ($\ln(\mathbf{d}_l + 1)$) components. Estimations according to (11) have come to dominate the literature, whether the focus has been on unions (Oaxaca and Ransom 1988), gender (Neumark 1988) or race (Cotton 1988, Oaxaca and Ransom 1994). Equation (11) is implicitly based on an assumption that a hypothetical elimination of discrimination will have only redistributive effects within labour's total share of output, but will not affect the size of the wage bill.

A limitation of the methodology described thus far is that it handles comparisons between only two groups at any time. Hinks (1999) describes a method that allows comparisons of several groups' wage levels against a pooled non-discriminatory wage structure. By following this approach it can be determined whether each of the different groups is favoured or discriminated against.

Using (2) and defining $\ln \bar{W}$ as the mean wage in the labour market as a whole, we can write

$$\begin{aligned} \ln(G_{kl} + 1) &= \ln\left(\frac{\bar{W}_k}{\bar{W}_l}\right) = \ln(\bar{W}_k) - \ln(\bar{W}_l) + \ln \bar{W} - \ln \bar{W} \\ &= \ln\left(\frac{\bar{W}_k}{\bar{W}}\right) - \ln\left(\frac{\bar{W}_l}{\bar{W}}\right) \\ &= \ln(\mathbf{g}_k + 1) - \ln(\mathbf{g}_l + 1), \end{aligned} \quad (12)$$

where

$$\mathbf{g}_i = \frac{\bar{W}_i}{\bar{W}} - 1, \quad i = k, l. \quad (13)$$

\mathbf{g}_i is the relative differential between the current mean wage of group i and the current mean wage of all employees.

¹If $\mathbf{d}_i = 0$ for both k and l , then no group has a wage advantage/disadvantage.

In similar fashion, we define \bar{W}^0 as the non-discriminatory mean wage for the whole labour force and rewrite (5) as

$$\begin{aligned}\ln(\mathcal{Q}_{kl} + 1) &= \ln\left(\frac{\bar{W}_k^0}{\bar{W}_l^0}\right) = \ln(\bar{W}_k^0) - \ln(\bar{W}_l^0) + \ln(\bar{W}^0) - \ln(\bar{W}^0) \\ &= \ln\left(\frac{\bar{W}_k^0}{\bar{W}^0}\right) - \ln\left(\frac{\bar{W}_l^0}{\bar{W}^0}\right) \\ &= \ln(\mathbf{q}_k + 1) - \ln(\mathbf{q}_l + 1),\end{aligned}\tag{14}$$

where

$$\mathbf{q}_i = \frac{\bar{W}_i^0}{\bar{W}^0} - 1, \quad i = k, l.\tag{15}$$

\mathbf{q}_i is the relative differential between the mean wage of group i in the absence of discrimination and the non-discriminatory mean wage of the entire workforce. In other words, if \mathbf{q}_i is positive it means that the mean productivity level of group i is higher than the mean productivity level of the labour force as a whole (and vice versa if it is negative).

Substituting (12) and (14) into (11) we obtain

$$[\ln(\mathbf{g}_k + 1) - \ln(\mathbf{g}_l + 1)] = [\ln(\mathbf{q}_k + 1) - \ln(\mathbf{q}_l + 1)] + [\ln(\mathbf{d}_k + 1) - \ln(\mathbf{d}_l + 1)].\tag{16}$$

The decomposition given by equation (16) has the advantage that each wage differential component is defined relative to the mean wage level of the entire workforce and is thus independent of any other group's wage differential. If equation (16) is manipulated slightly, this point becomes clearer. Let $k = g$, where g denotes successively the different groups of the population (e.g. African, Coloured, Asian and White), and let $l = H$, where H represents the entire workforce (i.e. all four groups combined).

Then we have

$$\ln(\mathbf{g}_H + 1) = \ln\left(\frac{\bar{W}_H}{\bar{W}}\right) = \ln \bar{W} - \ln \bar{W} = 0,$$

$$\ln(\mathbf{q}_H + 1) = \ln\left(\frac{\bar{W}_H^0}{\bar{W}^0}\right) = \ln \bar{W}^0 - \ln \bar{W}^0 = 0, \text{ and}$$

$$\ln(\mathbf{d}_H + 1) = \ln\left(\frac{\bar{W}_H}{\bar{W}_H^0}\right) = \ln \bar{W}_H - \ln \bar{W}_H^0 = 0 \text{ if } \bar{W}_H = \bar{W}_H^0.$$

Therefore, assuming that the current mean wage of the population *equals* the mean wage in the absence of discrimination (i.e. $\bar{W}_H = \bar{W}_H^0$), we see that equation (16) reduces to

$$\ln(\mathbf{g}_g + 1) = \ln(\mathbf{q}_g + 1) + \ln(\mathbf{d}_g + 1).\tag{17}$$

Equation (17) shows that Hinks' decomposition compares the individual group g to the entire workforce. In other words, decompositions following Hinks' approach define discrimination as favouring the mean wage of a group g relative to the mean wage of the whole workforce. Note

that if \mathbf{g}_g is positive (meaning a positive wage differential for group g relative to the all-group mean wage), this does not necessarily imply that both \mathbf{q}_g (the productivity component) and \mathbf{d}_g (the discrimination component) need be positive, just that their combined or *net* effect is positive. As earlier, there is an implicit assumption that the wage bill does not vary between discrimination and non-discrimination states of the world; the methodology thus abstracts from issues of capital's share of output and possible interaction effects on productivity caused by an altered rate of capital accumulation.

2.2 Estimation of discrimination coefficients

To make any of the decompositions suggested by (8), (11) or (16) operational, one needs to make explicit assumptions concerning what the wage structure would be in the absence of discrimination (which can also be interpreted as the wage structure under competitive conditions).

Common to all such approaches are estimations based on earnings functions of the form

$$\ln W_{gi} = X'_{gi} \mathbf{b}_g + u_{gi}, \quad (18)$$

where g refers to group g and i to individual i in group g .

Equation (18) relates the natural logarithm of the wage for a specific group to a vector of individual characteristics (both quantitative and qualitative), X_{gi} and a disturbance term, u (which is assumed to have Gauss-Markov properties). \mathbf{b}_g is a vector of coefficients. (In Hinks' estimations g may also stand for the entire sample H .)

Equation (18) can be estimated by

$$\ln(\hat{W}_{gi}) = X'_{gi} \hat{\mathbf{b}}_g. \quad (19)$$

Further, the estimate of the natural logarithm of a group's mean wage is given by

$$\ln(\hat{\bar{W}}_g) = \bar{X}'_g \hat{\mathbf{b}}_g. \quad (20)$$

$\hat{\bar{W}}_g$ is the estimated current mean wage of group g . \bar{X}'_g is a vector of mean characteristics for group g , and $\hat{\mathbf{b}}_g$ a vector consisting of the estimated coefficients from the earnings function given by (19).

Using equation (20), equation (2) can then be estimated by

$$\ln(\hat{G}_{kl} + 1) = \bar{X}'_k \hat{\mathbf{b}}_k - \bar{X}'_l \hat{\mathbf{b}}_l. \quad (21)$$

If we assume that discrimination takes the form of one group being under- or overpaid while the other group receives the non-discriminatory wage, then equation (8) can be estimated by applying (22a) or (22b) which follow.

Firstly, assume group k is overpaid. In the absence of discrimination this group would thus receive the same wage as group l . Hence the group l wage is interpreted as the non-discriminatory wage in this case.

² Since the regression line passes through the mean values of the variables.

$$\begin{aligned}\ln(\hat{G}_{kl} + 1) &= \bar{X}'_k \hat{\mathbf{b}}_k - \bar{X}'_l \hat{\mathbf{b}}_l = \bar{X}'_k \hat{\mathbf{b}}_k - \bar{X}'_l \hat{\mathbf{b}}_l + \bar{X}'_k \hat{\mathbf{b}}_l - \bar{X}'_k \hat{\mathbf{b}}_l \\ &= \bar{X}'_k (\hat{\mathbf{b}}_k - \hat{\mathbf{b}}_l) + (\bar{X}'_k - \bar{X}'_l) \hat{\mathbf{b}}_l\end{aligned}\quad (22a)$$

Related to equation (8), the productivity component of the wage gap is reflected by $(\bar{X}'_k - \bar{X}'_l) \hat{\mathbf{b}}_l$ and the discrimination component by $\bar{X}'_k (\hat{\mathbf{b}}_k - \hat{\mathbf{b}}_l)$.

When estimating discrimination the observed difference in sample mean wages is normally used rather than trying to estimate wage differences, i.e. using (22a). Usually only the productivity component is estimated via earnings functions and the discrimination component is thus defined as the residual between the log of the relative wage gap and the estimated productivity component. This is illustrated in the equation below.

$\ln(\hat{D}_{kl} + 1) = \ln(\hat{G}_{kl} + 1) - (\bar{X}'_k - \bar{X}'_l) \hat{\mathbf{b}}_l$, where \hat{G}_{kl} is the observed relative wage differential from the sample.

Assume instead that group l is underpaid. Now this form of discrimination implies that group l would be paid the same as group k in the absence of discrimination.

$$\begin{aligned}\ln(\hat{G}_{kl} + 1) &= \bar{X}'_k \hat{\mathbf{b}}_k - \bar{X}'_l \hat{\mathbf{b}}_l = \bar{X}'_k \hat{\mathbf{b}}_k - \bar{X}'_l \hat{\mathbf{b}}_l + \bar{X}'_l \hat{\mathbf{b}}_k - \bar{X}'_l \hat{\mathbf{b}}_k \\ &= (\bar{X}'_k - \bar{X}'_l) \hat{\mathbf{b}}_k + \bar{X}'_l (\hat{\mathbf{b}}_k - \hat{\mathbf{b}}_l)\end{aligned}\quad (22b)$$

Again, discrimination estimates are derived from an equation as

$$\ln(\hat{D}_{kl} + 1) = \ln(\hat{G}_{kl} + 1) - (\bar{X}'_k - \bar{X}'_l) \hat{\mathbf{b}}_k.$$

If we prefer the less restrictive notion that discrimination results in one group being overpaid by subsidisation from an underpaid group then estimation along the line of equation (11) can be expressed as

$$\ln(\hat{G}_{kl} + 1) = (\bar{X}'_k - \bar{X}'_l) \hat{\mathbf{b}}^* + \left[\bar{X}'_k (\hat{\mathbf{b}}_k - \hat{\mathbf{b}}^*) - \bar{X}'_l (\hat{\mathbf{b}}_l - \hat{\mathbf{b}}^*) \right].\quad (23)$$

$\hat{\mathbf{b}}^*$ refers to a vector of coefficients describing the non-discriminatory wage structure (i.e. coefficients from an earnings function).

$\hat{\mathbf{b}}^*$ may be defined as

$$\hat{\mathbf{b}}^* = \mathbf{f} \hat{\mathbf{b}}_k + (1 - \mathbf{f}) \hat{\mathbf{b}}_l.\quad (24)$$

The coefficients of the whole workforce are some (linear) combination of the coefficients of the different groups. Since we can estimate $\hat{\mathbf{b}}_i$ from the earnings functions, estimation of $\hat{\mathbf{b}}^*$ becomes a question of how to determine \mathbf{f} .

If we let \mathbf{f} take the value 0 or 1, we see that (23) reduces to (22a) or (22b). So the assumption of one group being either over- or underpaid, as made by Oaxaca (1973), is a special case of the more general specification given by (23). Cotton (1988) suggests that the fraction of the entire sample that each group constitutes should be used as estimators for \mathbf{f} and $(1 - \mathbf{f})$. This weighting is based on a number of assumptions. First, one group is paid more than what the wage would be in the absence of discrimination and the other group less. Second, $\hat{\mathbf{b}}^*$ is a strict linear combination of the groups' wage structures $(\hat{\mathbf{b}}_k, \hat{\mathbf{b}}_l)$. These assumptions imply that

$f \in (0,1)$, and that the non-discriminatory wage structure will be closer to the current majority group's wage structure.³ Mathematically,

$$\hat{f} = \frac{K}{K+L}, \quad (25)$$

where K and L are the sample sizes of the respective groups.

Another, more general, weighting scheme is suggested by Oaxaca and Ransom (1994). Here a row vector of coefficients describing the non-discriminatory wage structure is defined as

$$\hat{\mathbf{b}}^{**} = \Phi \hat{\mathbf{b}}_k + (I - \Phi) \hat{\mathbf{b}}_l, \quad (26)$$

where Φ is defined as

$$\Phi = [X_p' X_p]^{-1} X_k' X_k = [X_k' X_k + X_l' X_l]^{-1} X_k' X_k. \quad (27)$$

X_p refers to a vector of mean characteristics for a pooled sample including all individual groups.

Neumark (1988) shows how $\hat{\mathbf{b}}^{**}$ can be estimated as the set of coefficients from a least squares regression based on a pooled sample containing all groups. By substituting $\hat{\mathbf{b}}^{**}$ for $\hat{\mathbf{b}}^*$ equation (23) still holds, but now with a different interpretation of the coefficients describing the non-discriminatory wage structure.

If a multilateral decomposition is desired, estimates of the different components of equation (17) are given by

$$\ln(\hat{\mathbf{g}}_g + 1) = \ln \hat{W}_g - \ln \hat{W} = \bar{X}_g' \hat{\mathbf{b}}_g - \bar{X}' \hat{\mathbf{b}} \quad (28)$$

$$\ln(\hat{\mathbf{q}}_g + 1) = \ln \hat{W}_g^0 - \ln \hat{W} = (\bar{X}_g - \bar{X})' \hat{\mathbf{b}} \quad (29)$$

$$\ln(\hat{\mathbf{d}}_g + 1) = \ln \hat{W}_g - \ln \hat{W}_g^0 = \bar{X}_g' (\hat{\mathbf{b}}_g - \hat{\mathbf{b}}) \quad (30)$$

Again, g represents the particular group in question, and $\hat{\mathbf{b}}$ is a vector of coefficients describing the non-discriminatory wage structure. $\hat{\mathbf{b}}$ is estimated by a least squares regression on a (pooled) sample containing all groups.⁴

³Cotton conducts an analysis based on race in the US (for males only). In this case White workers are favoured by discrimination and Whites are also the majority group in the workforce. Thus, the non-discriminatory wage structure is closest to the White wage structure. But if the group disfavoured by discrimination constitutes the majority of the workforce, then the non-discriminatory wage structure will be closer to the disfavoured group.

⁴Again we can show that $\ln(\hat{\mathbf{g}}_k + 1) - \ln(\hat{\mathbf{g}}_l + 1) = \ln(\hat{\mathbf{q}}_k + 1) - \ln(\hat{\mathbf{q}}_l + 1) + \ln(\hat{\mathbf{d}}_k + 1) - \ln(\hat{\mathbf{d}}_l + 1)$ is reduced to $\ln(\hat{\mathbf{g}}_g + 1) = \ln(\hat{\mathbf{q}}_g + 1) + \ln(\hat{\mathbf{d}}_g + 1)$ by letting $k = g$ where g is a sample group, letting $l = H$ where H denotes the pooled sample, and assuming that $\hat{W} = \hat{W}^0$. The last assumption implies that the estimated mean wage of the full sample is the estimated non-discriminatory mean wage.

2.3 Decomposition's foundation in discrimination theory

As shown in the previous section, to render any decomposition operational, certain assumptions concerning the non-discriminatory wage structure have to be made. Since any estimation results hinge on these assumptions it is natural to explore how well they are rooted in theory. Economic analysis in the field of the economics of discrimination started with Edgeworth, but the first major studies were produced by Becker (1971) and Arrow (1973). The following section draws from Neumark (1988), based on Becker and Arrow.

Discrimination can take several forms, notably employer, employee and consumer discrimination. Firstly, in a neoclassical framework, employer discrimination implies that the employer has a preferred taste for certain workers. The employer thus does not seek to maximise profit alone, but rather a utility function in which both profit and types (or groups) of workers are arguments. This type of discrimination arises from the employer's desire to pay different groups different wages. Secondly, employee discrimination can be understood as workers having to be compensated by a higher wage to work alongside other groups of workers. However, the interpretation does not have to be in wage terms. Arrow (1973) gives an example of a Black foreman supervising White 'floor workers' where the cost of discrimination can be reflected in reduced productivity, lower morale etc. among the White workers. Thirdly, consumer discrimination is present if consumers are willing to pay higher prices to purchase goods produced by specific groups of favoured workers.

Following Neumark (1988), the emphasis here is on employer discrimination, the justification being that firms are the major determinants of labour demand. The link between employers' discriminatory tastes and the competitive wage (non-discriminatory wage) is also established.

In the following model the economy consists of identical firms. The firms produce Y with labour as the only input. But there are two types of labour, A and B (for example skilled and unskilled). Within each type of labour there are two groups, K and L (gender, race, union membership etc). The two groups of workers are perfect substitutes in production. With no discrimination the different types of workers would be paid wages equal to their relative marginal productivities.

$$W_{KA}^0 = MP_{KA} = MP_{LA} = W_{LA}^0 \quad \text{for type A workers and}$$

$$W_{KB}^0 = MP_{KB} = MP_{LB} = W_{LB}^0 \quad \text{for type B workers.}$$

Productivity can thus differ between types of workers (because of different skill levels), but is assumed the same among workers of the same type. Further we assume a strictly concave production function, and fixed supply of labour. Production can then be described as:

$$A = K_A + L_A \quad (31)$$

$$B = K_B + L_B \quad (32)$$

$$Y = f(A, B) = f[(K_A + L_A), (K_B + L_B)] \quad (33)$$

$$\Pi = f[(K_A + L_A), (K_B + L_B)] - W_{KA} K_A - W_{LA} L_A - W_{KB} K_B - W_{LB} L_B \quad (34)$$

Equations (31) and (32) indicate that the supply of different types of labour is presumed completely inelastic, while (33) defines the production function and (34) expresses the firm's profit when the product price is numeraire.

⁵ W_{ij}^0 is the competitive wage of type j workers from group i . MP_{ij} is the marginal product of type j workers from group i .
 $j=A, B$
 $i=K, L$

Since we allow employers to have preferences over groups of labour, they maximise not profits alone, but a strictly concave utility function where profit is an argument together with quantities of two types of employees (A, B) belonging to two different groups (K, L).

$$U = U(\Pi, K_A, L_A, K_B, L_B) \quad (35)$$

$$\text{where} \quad \frac{\partial U}{\partial \Pi} \geq 0, \quad \frac{\partial U}{\partial K_A} \geq 0, \quad \frac{\partial U}{\partial K_B} \geq 0, \quad \frac{\partial U}{\partial L_A} \leq 0, \quad \frac{\partial U}{\partial L_B} \leq 0$$

When the marginal utility of a group of workers is positive they are subject to nepotism, and when it is negative the group of workers is disfavoured. In our model by assumption group K is subject to nepotism and group L is disfavoured.

Optimal behaviour of the employer is determined by

$$\max_{\Pi, K_A, L_A, K_B, L_B} \{U(\Pi, K_A, L_A, K_B, L_B)\}$$

The first order conditions are then given by⁶

$$\frac{\partial U}{\partial \Pi} \frac{\partial \Pi}{\partial K_A} + \frac{\partial U}{\partial K_A} = 0 \quad \Leftrightarrow \quad \frac{\partial U}{\partial \Pi} \left(\frac{\partial f(A, B)}{\partial A} - W_{KA} \right) + \frac{\partial U}{\partial K_A} = 0 \quad \text{and} \quad (36a)$$

$$\frac{\partial U}{\partial \Pi} \frac{\partial \Pi}{\partial L_A} + \frac{\partial U}{\partial L_A} = 0 \quad \Leftrightarrow \quad \frac{\partial U}{\partial \Pi} \left(\frac{\partial f(A, B)}{\partial A} - W_{LA} \right) + \frac{\partial U}{\partial L_A} = 0. \quad (36b)$$

Equivalent conditions hold for type B (unskilled).

Using rearrangements of (36a) and (36b) we can define

$$d_{KA} = -\frac{\partial U / \partial K_A}{\partial U / \partial \Pi} \quad \text{and} \quad d_{LA} = -\frac{\partial U / \partial L_A}{\partial U / \partial \Pi}. \quad (37)$$

d_{KA}, d_{LA} , can be interpreted as discrimination coefficients (or the difference between marginal productivity and the wage rate). If $d_{Kj} < 0$ (marginal utility of group K workers is positive) group K workers are subject to nepotism. If $d_{Lj} > 0$ group L workers are disfavoured. Substituting from equation (37) into (36a) and (36b) gives

For type A workers

$$W_{KA} = \frac{\partial f(A, B)}{\partial A} - d_{KA} \quad , \text{ where} \quad d_{KA} \leq 0 \quad \text{since} \quad \frac{\partial U}{\partial K_A} \geq 0 \quad (38a)$$

$$W_{LA} = \frac{\partial f(A, B)}{\partial A} - d_{LA} \quad , \text{ where} \quad d_{LA} \geq 0 \quad \text{since} \quad \frac{\partial U}{\partial L_A} \leq 0 \quad (38b)$$

⁶ To make the first order conditions complete we should include $\frac{\partial U}{\partial \Pi} = 0$ which is equivalent to the first order condition of profit maximisation. But since this term does not influence our discussion, ignore it.

For type B workers

$$W_{KB} = \frac{\partial f(A, B)}{\partial B} - d_{KB} \quad , \text{ where } \quad d_{KB} \leq 0 \quad \text{since } \quad \frac{\partial U}{\partial K_B} \geq 0 \quad (38c)$$

$$W_{LB} = \frac{\partial f(A, B)}{\partial B} - d_{LB} \quad , \text{ where } \quad d_{LB} \geq 0 \quad \text{since } \quad \frac{\partial U}{\partial L_B} \leq 0 \quad (38d)$$

From (38a)-(38d) we see that the favoured group (K) of workers receives at least their marginal product while the disfavoured group (L) gets paid at most their marginal product.

For type A workers

$$W_{KA} \geq \frac{\partial f(A, B)}{\partial A} \geq W_{LA} \quad (39a)$$

For type B workers

$$W_{KB} \geq \frac{\partial f(A, B)}{\partial B} \geq W_{LB} \quad (39b)$$

We have now established a framework that enables us to link the theory of discrimination to various ways of decomposing wage differences.

First, let us first assume a baseline where there is no nepotism. Given our model this implies that $d_{KA} = d_{KB} = 0$ and $d_{LA}, d_{LB} \geq 0$. (In the presence of discrimination at least one of the discrimination coefficients for type L workers must be strictly greater than zero.) From (38a) and (38c) we see that group K workers will be paid their marginal product in their respective sectors, while L workers will be paid less than their marginal product. The discriminatory wage structure therefore pays group K workers according to their productivity, while group L workers are paid less than they are worth. But in the *absence* of discrimination group K will retain their non-discriminatory wage and group L will receive a higher wage than were discrimination present. This baseline situation maps to the wage decomposition in which discrimination takes the form of one group being underpaid (see Equation (22b)).

Next, let employer discrimination be characterised by nepotism towards group K only. Then $d_{LA} = d_{LB} = 0$ and $d_{KA}, d_{KB} \leq 0$. Now type L workers will be paid their marginal product, while K workers will receive a wage in excess of their marginal productivity. In the *absence* of discrimination wages for group L would be unaltered while group K workers would be paid less. This scenario maps to the wage decomposition where discrimination is characterised by one group being overpaid (see equation (22a)).

When employer discrimination takes the form of either nepotism or disfavourism, a hypothetical elimination of discrimination, and the emergence of a competitive market-clearing wage, will alter the received wage of only one group.

Perhaps the most interesting case is when we allow employer discrimination to take the form of *both* nepotism and disfavourism simultaneously. What then will the wage structure become if discrimination should disappear? For further discussion to be meaningful, we have to impose an additional restriction on the utility function. Assume that the utility function is homogenous of degree zero within each type of labour.⁷ The intuition behind this restriction is that the employer

⁷ $U(\Pi, t_1 K_A, t_1 L_A, t_2 K_B, t_2 L_B) = t_i^0 \times U$, where $i=1, 2$.

is concerned only about the *ratio* of worker groups within each type of labour; the absolute number of workers from different groups is of no concern to the employer.

Since the utility function is homogenous of degree zero it follows from Euler's rule (Sydsaeter, Strøm and Berck 1998) that

$$\frac{\partial U}{\partial K_A} K_A + \frac{\partial U}{\partial L_A} L_A = 0 \quad \text{and} \quad (40a)$$

$$\frac{\partial U}{\partial K_B} K_B + \frac{\partial U}{\partial L_B} L_B = 0. \quad (40b)$$

Dividing through by $-\frac{\partial U}{\partial \Pi}$ and using the first order conditions (38a-d) we obtain

$$\left(\frac{\partial f(A, B)}{\partial A} - W_{KA} \right) K_A + \left(\frac{\partial f(A, B)}{\partial A} - W_{LA} \right) L_A = 0 \quad \Leftrightarrow$$

$$\frac{\partial f(A, B)}{\partial A} = \frac{W_{KA} K_A + W_{LA} L_A}{K_A + L_A} = W_A^0 \quad (41a)$$

$$\left(\frac{\partial f(A, B)}{\partial B} - W_{KB} \right) K_B + \left(\frac{\partial f(A, B)}{\partial B} - W_{LB} \right) L_B = 0 \quad \Leftrightarrow$$

$$\frac{\partial f(A, B)}{\partial B} = \frac{W_{KB} K_B + W_{LB} L_B}{K_B + L_B} = W_B^0 \quad (41b)$$

For each type, the wage received in the absence of discrimination is equivalent to a weighted average of the respective wages received with employer discrimination present. This holds for both types of labour. The competitive wage of the group facing nepotism would thus be lower in the absence of employer discrimination and the wage of the disfavoured group would be higher. This interpretation of discrimination can be utilised for wage decompositions where the current wage structure is described by both over- and under-payments (see equation (23)).

3. Data Used and the Determination of Earnings Functions

3.1 Data

The data for our analysis are derived from the 1993 Southern Africa Labour and Development Research Unit (SALDRU) Household Survey (SALDRU93) and the 1995 October Household Survey (OHS95).

SALDRU93 was the first comprehensive household survey of the entire South African population (former TBVC states were also included). The survey was of a two-stage self-weighting design. First 360 clusters (enumerated areas) were determined and next 25 households from each cluster were surveyed. Thus, some 9000 households were questioned, and with an average of 5 persons per household, the sample consists of 45 000 individuals.

The October Household Survey has been conducted annually by Statistics South Africa since 1993, but 1994 was the first year in which a sample representative of the whole population was

defined. The OHS95 survey was stratified according to provinces. Then 3000 enumerated areas were defined and next 10 households were questioned from each enumerated area. Thus, some 30 000 households in total were surveyed in OHS95. Assuming an average of 5 persons per household, 150 000 individuals were surveyed in the OHS95.

3.2 Sample Definition

Discrimination is estimated as the residual between the observed wage gap and the component of the wage differential explained by productivity characteristics. Since discrimination is estimated as a residual, we exclude discriminatory factors not manifest as different pay for equal work. This implies that potential differentiating factors such as quality of education, the influence of experience and occupational barriers are either treated as pre-labour market discrimination or are ignored. This is not to presume that such factors are unimportant, but rather that they are very difficult to quantify. The issue of discrimination in access to occupations is addressed partially through the use of dummy variables, but we have no controls for quality of education. Females are treated separately so as not to introduce gender bias into the discrimination estimates. Further, we concentrate on regular wage employment. To capture the core labour force, an age restriction ranging from 15 to 64 is imposed. Moreover, the self employed, casual workers, not currently employed workers and workers with non-positive wages are also omitted from the sample. Employees with non-positive figures reported for hours worked in the previous week are also excluded. Finally, observations with data missing on any variable included in the earnings functions were disregarded. The samples then consist of regular, wage earning employees between 15 and 64 years of age. Given these described restrictions, the sample size was reduced to 2223 male and 1570 female observations in 1993 and 11 727 male and 5822 female observations in 1995.

3.3 Earnings Functions

Utilising the residual as the basis for the discrimination estimates implies that correct specifications of the earning functions are crucial so as not to allow omitted variable bias into the estimates. Obviously discrimination will seem smaller the more of the wage gap that can be explained by productivity differences. Thus, one should be particularly careful concerning which variables to include in the model specification. We describe below our choice of variables and our reasoning why they should be included in the earning functions.

3.3.1 Dependent Variable

The dependent variable is the worker's gross wage. This includes normal wage and overtime payments. It is used as the dependent variable since in the net wage deductions of a redistributive nature would lead to underestimation of the wage gap. SALDRU93 data on regular wage employees include self-employed professionals. Cross tabulation of occupation and employment status showed that no professionals reported their income from self-employment in OHS95. Some designated themselves as semi self-employed and for this group the dependent variable is defined as the gross wage plus gross income from own account activities, less actual expenses. Although the two 1993 and 1995 data on self-employment are thus not strictly comparable, the discrepancies are of a very minor nature.

3.3.2 Independent Variables

All discrimination estimates are based on estimated earnings functions. The earnings functions contain two types of independent variable: data set variables, which are related to the design of the survey and should be included to get reliable point estimates and variance estimates; and

individual variables, both quantitative and qualitative, which contain individual-specific information.

3.3.2.1 Data Set Variables

Weights

Household surveys can be designed to be self-weighting so that the sample reflects the population that is surveyed. But often the obtained sample fails to be self-weighting. SALDRU93 failed to represent accurately the whole population because Whites were over-represented as non-respondents and because some areas could not be surveyed due to the crime situation. Where the population characteristics are not reflected by the available sample, probability weights can be used as a means of correction. Such weights are defined according to the inverse of the probability of being in the sample. Observations that are more likely to be in the sample than in the population will be weighted lower and vice versa. As an example, the weighting of White observations was scaled up in SALDRU93 since White observations as a whole were underrepresented in the sample.

If a sample does not represent the population it is taken from, failing to adjust by weighting will result in biased point estimates. Probability weights are thus included when estimating mean values. Using weights in regressions is a controversial issue, but following Deaton's (1997) advice weights are also included in the earnings function regressions.

Clusters

Both SALDRU93 and OHS95 were clustered surveys. When data are collected from clusters, differential information is 'lost' since neighbouring households are more likely to produce similarities than two random households (for instance regarding income, crime rate, number of children, etc.). Observations within clusters are therefore not truly independent. Imagine an extreme case where data are gathered from an agricultural based cluster in a rural area in a developing country. There, the marginal household is not likely to give much additional information (Deaton 1997). Thus failing to take clusters into account will produce variances of our estimated variables that are too small.

3.3.2.2 Individual Characteristics

Education

To account for education as a determinant of wages, a continuous variable measuring years of education is used. This is obtained by converting information on educational categories into number of years of education completed. An obvious problem when using this variable is that access to, and the quality of, education are unspecified. Differential access to education may be justifiably regarded as pre-labour market discrimination. Nevertheless, the quality of education is undoubtedly correlated with a worker's productivity, and is therefore likely to be reflected in wage differentials. But measuring quality of education is complicated, and the available data sets did not contain potential indicators of the quality of education (e.g. mean school results in nationwide, standardised examinations). The influence of the quality of education on wages thus has to be omitted from the analysis.

Education Squared

A squared term for years of education is included to allow for the possibility that education's influence on wages is non-linear.

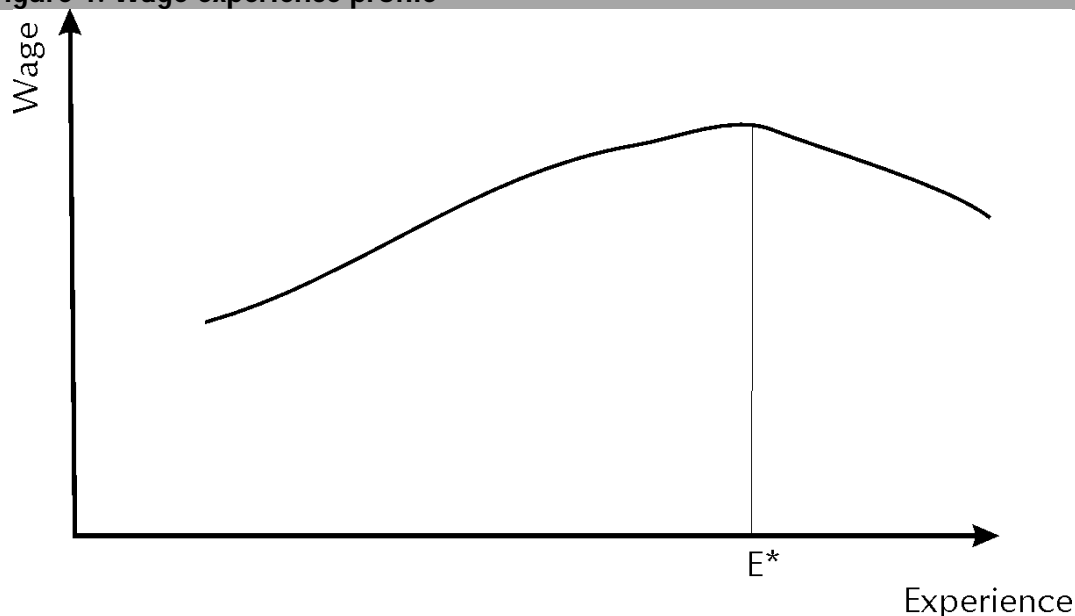
Experience

Potential work experience is included as another independent variable. Actual experience is unavailable so potential experience is used as a proxy. Potential experience is defined as worker's age, minus the number of years of schooling, minus the age at school entrance (Mincer 1993).⁸ While the accuracy of this measure can be questioned, it is arguable that simply using age itself is the greater of two sources of inadequate specification.

Experience Squared

A quadratic term for experience is also included in the regression specification. This is to allow for increasing and then decreasing returns to experience over the average working life, as suggested by human capital theory. The empirically observed wage-experience profile is illustrated in Figure 1. Based on this pattern we expect the coefficient of potential experience to be positive and the coefficient of the squared term to be negative.

Figure 1: Wage-experience profile



Using potential experience as a proxy for actual experience is likely to overestimate the quantity of experience, since temporary retreats from the labour market are not accounted for. Thus, the peak of the wage-experience profile will not be accurate. Potential earnings gains from experience also depend on other labour market characteristics such as occupational categories. As an illustration, one would presume that a newly employed secretary has less to gain from experience compared to an inexperienced trainee manager (Bergmann 1973). Adjusting for occupations takes this effect into account, but if gains from experience are linked, for example, to the quality of education, then such relationships are unaccounted for in this procedure.

For females, a more reliable proxy for actual experience could be obtained by adjusting for number of children. But SALDRU93 reports number of children only for females younger than 49 years old, while OHS95 reports number of children for females younger than 55 years. We are therefore denied the option of adjusting for number of children unless we restrict the sample significantly.

⁸ $Potential\ Experience = Age - Years\ of\ Education - 6$

Another variable that might influence wage earnings is job tenure. But information on tenure is available in neither data set and thus this variable has to be excluded.

Location

We include a dummy variable for location to test the hypothesis that workers in urban areas earn more than in rural areas. SALDRU93 reports location in three categories: Metropolitan, Urban and Rural. Location in a metropolitan area indicates residence in one of the major South African cities. For our purpose the metropolitan and urban categories are collapsed into one urban category.

Union membership

A dummy for union membership is included to test the hypothesis that unionised workers earn higher wages than non-unionised workers. SALDRU93 does not include specific information on union membership, but paid up union members are recorded and this figure is used as a proxy for union membership.

Industry

Dummy variables for nine one-digit sectoral categories are included. Making such categories comparable across the two data sets did not involve major difficulties.

Occupation

The earnings functions include dummies for eight one-digit occupational categories, since wages are observed to vary substantially among occupations. Occupation may also serve as an indication of workers' abilities in addition to quantifiable variables such as education. Given the historical background to the South African labour market, the occupational distribution reflects past discrimination in that certain groups were excluded from high earning occupations. By design, the scope of our estimations is to determine discrimination in the form of unequal pay for equal work. Occupational barriers for certain groups, insofar as they exist, are thus beyond the scope of this paper.

The occupational breakdown in SALDRU93 is more limited in range than in the OHS95 survey. Hence adjustments to make OHS95 categories congruent with SALDRU93 categories had to be made. In the 1993 data 'Professionals, Associate-Professionals and Technicians,' for example, were treated as one occupational category. Thus, for compatibility, the more complete breakdown of the OHS95 survey had to be compressed to fit the 1993 data. Similarly, 'Clerical and Sales' occupations were defined as one category in 1993 while these two occupations were reported separately in 1995. Again 1995 data were adjusted to fit 1993 data. A further obstacle was that 'Farming and related' occupations in 1993 had changed to 'Skilled Agriculture and Fishery' workers in 1995. In the absence of disaggregated detail no attempt was made to adjust for this change, and a net reduction in the number of workers in agricultural occupations from 1993 to 1995 is expected. Such a reduction in the number of agricultural workers implies increased numbers in unskilled occupations as we move to 1995. Finally, in OHS95, army employees were not reported in separate occupations and therefore had to be excluded from the OHS95 sample since there was no comparable category in SALDRU93.

Province

Dummies for South Africa's nine provinces are included. Provinces were defined differently in 1993 and 1995, but based on information about regions, data from 1993 can be transformed to match the new provincial definitions from 1994 onwards. Ideally, information on province of

work would be preferred to information on province of residence. But data on the former were not available for SALDRU93. Province of residence is thus used as a proxy for province of work for both data sets. Since data were collected just before and just after the fall of the apartheid regime, evidence of significant movements between provinces may be expected. However, it is debatable whether the adjustment for changing provincial boundaries can be defended as sufficiently accurate to allow a direct comparison between the 1993 and 1995 samples.

After running ordinary least squares regressions according to the earnings function specifications described above, Wald adjusted F-tests for the joint significance of respectively education, experience, industry, occupation and province variables were performed. All F-values turned out to be significantly different from zero at the five per cent level.

4. Results

4.1 Males

Table 1 shows the weighted mean values for male worker characteristics estimated from the 1993 and 1995 samples. It can be seen that the overall – all workers – nominal mean wage has increased from 1993 to 1995. Coloured and White workers contradict the overall trend by receiving lower nominal mean wages in 1995 compared to 1993, although the recorded decrease is very small, particularly for Whites.

The mean number of years of education has increased when measured for all males. The increase in years of education completed is most apparent for Africans, while paradoxically Coloureds have less education in 1995 than in 1993, on average.⁹ The definition of the potential experience variable would normally imply less potential experience when years of education increase. Still, Table 1 suggests *increasing* potential experience alongside increasing educational levels. A possible explanation for this anomaly is differing age distributions for the two years. If the age distribution in 1995 is more skewed toward the right than in 1993, the estimated mean values are consistent.

The urban-rural distribution suggests that approximately 12 per cent more male employees are located in urban areas in 1995 compared with 1993. Urbanisation is most noticeable among Africans, whereas the proportion of Coloureds living in rural areas actually rises. Since this result is counter-intuitive, it may indicate problems with the data. A larger proportion of male workers is organised in unions in 1995 (although the increase is only 3 per cent). Coloureds and Asians exhibit contradictory trends vis-à-vis the overall population – another result difficult to rationalise.

The sectoral distribution of employment did not change dramatically from 1993 to 1995. We note a declining proportion of employees in the mining and transport industries, while the wholesale and service industries are expanding their share of wage employment. Mean values for numbers in occupational categories are more or less constant across the two data sets. As expected, agricultural occupations are declining, but the decline is probably a result of differing occupational definitions for the two surveys. In SALDRU93, agricultural occupations include all agricultural occupations, while OHS95 includes only skilled agricultural workers. Matching the decline in agricultural occupations, an increase in the proportion of unskilled workers is observed.

⁹ Without significant additional information, one can only speculate as to whether this apparently counter-intuitive result indicates data inaccuracy or a significant sociological change.

Provincial dummies reflect province of residence. The results in Table 1 indicate that substantial movement occurred among provinces. Especially prominent are movements out of Mpumalanga and North West Province and into Gauteng and Free State – possibly reflecting the geographical distribution of jobs. However, the overall means conceal large provincial changes for certain racial groups. For example, it seems unlikely that 18 per cent of Whites moved *out* of the Western Cape within a two-year period, as indicated by the data. Part of the explanation may lie in the conversion of the SALDRU93 data from the four old provinces to the nine new provinces. By and large, one's confidence in these dummies cannot be too high.

Table 1: Male weighted mean sample characteristics

Variable Name	Code	1993 Mean Estimates					1995 Mean Estimates				
		All	African	Coloured	Asian	White	All	African	Coloured	Asian	White
Log Gross Mth Wage	lnwage	7.028	6.568	7.008	7.641	8.405	7.174	6.854	6.937	7.793	8.394
Years of Education	yrsed	7.987	6.440	8.252	10.995	12.121	8.582	7.582	7.770	11.194	12.313
Years of Ed Squared	yrse dsq	83.632	58.971	78.129	129.429	156.190	91.731	75.407	75.037	130.574	155.657
P. Work Experience	exp	21.789	23.394	20.687	18.068	18.194	22.526	24.028	20.676	17.981	19.040
P. Work Exp Squared	exp sq	624.607	707.725	552.622	458.018	439.953	652.213	721.026	570.898	453.165	488.380
Rural	locdum1	0.482	0.701	0.134	0.022	0.098	0.362	0.466	0.297	0.046	0.080
Urban	locdum2	0.518	0.299	0.866	0.978	0.902	0.638	0.534	0.703	0.954	0.920
Member	uniond1	0.328	0.335	0.414	0.433	0.223	0.359	0.393	0.279	0.298	0.296
Not Member	uniond2	0.672	0.665	0.586	0.567	0.777	0.641	0.607	0.721	0.702	0.704
Agric/Fish/Forest/Hunt	inddum1	0.186	0.243	0.180	0.000	0.050	0.198	0.240	0.287	0.010	0.026
Mining/Quarrying	inddum2	0.141	0.180	0.030	0.015	0.117	0.088	0.103	0.019	0.007	0.096
Manufacturing	inddum3	0.178	0.136	0.312	0.390	0.174	0.186	0.168	0.183	0.333	0.223
Electricity	inddum4	0.033	0.025	0.037	0.014	0.060	0.014	0.013	0.007	0.007	0.024
Construction	inddum5	0.083	0.078	0.097	0.064	0.096	0.064	0.059	0.116	0.054	0.052
Wholesale	inddum6	0.104	0.103	0.115	0.177	0.077	0.139	0.119	0.151	0.328	0.167
Transort	inddum7	0.099	0.074	0.085	0.106	0.187	0.050	0.046	0.040	0.055	0.070
Finance	inddum8	0.031	0.009	0.021	0.015	0.114	0.055	0.040	0.035	0.073	0.119
Service	inddum9	0.146	0.151	0.123	0.220	0.124	0.206	0.212	0.162	0.133	0.224
Professional	occdum1	0.118	0.067	0.055	0.184	0.307	0.114	0.080	0.072	0.146	0.260
Manager	occdum2	0.051	0.009	0.033	0.078	0.197	0.042	0.014	0.012	0.078	0.160
Clerk & Sale	occdum3	0.078	0.070	0.054	0.192	0.088	0.110	0.097	0.102	0.316	0.116
Service	occdum4	0.076	0.091	0.041	0.057	0.053	0.079	0.086	0.050	0.048	0.081
Agriculture	occdum5	0.085	0.129	0.011	0.000	0.008	0.008	0.006	0.008	0.001	0.019
Craft & Trade	occdum6	0.148	0.103	0.228	0.199	0.235	0.164	0.130	0.195	0.211	0.263
Skilled Worker	occdum7	0.191	0.193	0.266	0.283	0.108	0.185	0.219	0.156	0.159	0.081
Unskilled Worker	occdum8	0.253	0.338	0.312	0.007	0.004	0.298	0.367	0.404	0.042	0.020
Western Cape	provdum1	0.181	0.053	0.738	0.014	0.311	0.131	0.048	0.646	0.029	0.130
Northern Cape	provdum2	0.019	0.014	0.083	0.000	0.000	0.021	0.012	0.095	0.000	0.014
Eastern Cape	provdum3	0.069	0.080	0.068	0.000	0.055	0.087	0.095	0.102	0.015	0.065
KwaZulu/Natal	provdum4	0.167	0.132	0.101	0.956	0.093	0.169	0.173	0.025	0.790	0.114
Free State	provdum5	0.011	0.018	0.000	0.000	0.000	0.088	0.114	0.015	0.000	0.055
Mpumalanga	provdum6	0.176	0.243	0.000	0.022	0.110	0.075	0.099	0.004	0.007	0.047
Northern Province	provdum7	0.077	0.102	0.000	0.000	0.061	0.052	0.065	0.030	0.000	0.027
North West	provdum8	0.187	0.259	0.007	0.008	0.110	0.088	0.112	0.010	0.009	0.065
Gauteng	provdum9	0.113	0.098	0.003	0.000	0.261	0.289	0.282	0.072	0.150	0.484
Sample Size		2223	1446	271	141	365	11727	7442	1926	589	1770

Table 2: Male weighted earnings regression

Variable	1993 Male Earnings Regression					1995 Male Earnings Regression					
	Coef.	Std. Err.	t	P> t	Dum Int	Coef.	Std. Err.	t	P> t	Dum Int	
yrsted	-0.004	0.014	-0.285	0.776		-0.005	0.008	-0.566	0.576		
yrstedsq	0.007	0.001	7.407	0.000		0.007	0.001	13.355	0.000		
exp	0.051	0.005	11.372	0.000		0.037	0.003	14.061	0.000		
expsq	-0.001	0.000	-8.660	0.000		0.000	0.000	-9.093	0.000		
locdum1	-0.299	0.077	-3.905	0.000	-0.259	-0.213	0.032	-6.567	0.000	-0.192	
locdum2	0.000	Base Case				0.000	Base Case				0.000
uniond1	0.031	0.057	0.552	0.581	0.032	0.108	0.014	7.458	0.000	0.114	
uniond2	0.000	Base Case				0.000	Base Case				0.000
inddum1	-0.447	0.152	-2.944	0.004	-0.361	-0.734	0.045	-16.362	0.000	-0.520	
inddum2	0.081	0.132	0.613	0.541	0.084	-0.019	0.052	-0.359	0.722	-0.018	
inddum3	0.000	Base Case				0.000	Base Case				0.000
inddum4	0.052	0.092	0.563	0.574	0.053	0.164	0.048	3.427	0.002	0.178	
inddum5	-0.121	0.073	-1.669	0.097	-0.114	-0.223	0.038	-5.869	0.000	-0.200	
inddum6	-0.174	0.053	-3.282	0.001	-0.160	-0.194	0.019	-10.018	0.000	-0.176	
inddum7	0.082	0.060	1.351	0.178	0.085	0.097	0.027	3.657	0.001	0.102	
inddum8	0.142	0.108	1.312	0.191	0.153	-0.023	0.036	-0.650	0.520	-0.023	
inddum9	-0.125	0.059	-2.116	0.035	-0.117	-0.095	0.025	-3.722	0.001	-0.090	
occdum1	0.824	0.090	9.163	0.000	1.280	0.679	0.028	24.085	0.000	0.972	
occdum2	1.086	0.100	10.821	0.000	1.963	1.046	0.047	22.080	0.000	1.845	
occdum3	0.551	0.067	8.205	0.000	0.735	0.337	0.023	14.560	0.000	0.400	
occdum4	0.482	0.082	5.849	0.000	0.620	0.387	0.036	10.867	0.000	0.473	
occdum5	-0.428	0.196	-2.186	0.030	-0.348	0.792	0.086	9.174	0.000	1.209	
occdum6	0.520	0.072	7.236	0.000	0.683	0.482	0.034	14.204	0.000	0.620	
occdum7	0.313	0.059	5.304	0.000	0.368	0.241	0.018	13.536	0.000	0.273	
occdum8	0.000	Base Case				0.000	Base Case				0.000
provdum1	0.097	0.077	1.257	0.210	0.101	0.041	0.031	1.312	0.199	0.042	
provdum2	-0.174	0.237	-0.735	0.463	-0.160	-0.126	0.058	-2.190	0.036	-0.119	
provdum3	-0.090	0.115	-0.782	0.435	-0.086	-0.170	0.022	-7.748	0.000	-0.156	
provdum4	0.000	Base Case				0.000	Base Case				0.000
provdum5	-0.238	0.083	-2.884	0.004	-0.212	-0.374	0.031	-12.168	0.000	-0.312	
provdum6	0.104	0.102	1.021	0.308	0.109	0.006	0.043	0.137	0.892	0.006	
provdum7	-0.018	0.077	-0.233	0.816	-0.018	0.038	0.045	0.840	0.407	0.038	
provdum8	-0.109	0.122	-0.895	0.372	-0.103	-0.151	0.061	-2.484	0.018	-0.140	
provdum9	0.142	0.101	1.408	0.161	0.153	0.086	0.037	2.352	0.025	0.090	
_cons	5.682	0.116	48.962	0.000		5.995	0.069	86.994	0.000		

F = 72
R-squared = 0.69
N = 2223

F = 2238
R-squared = 0.70
N = 11,727

Figure 2: Male wage-education profile

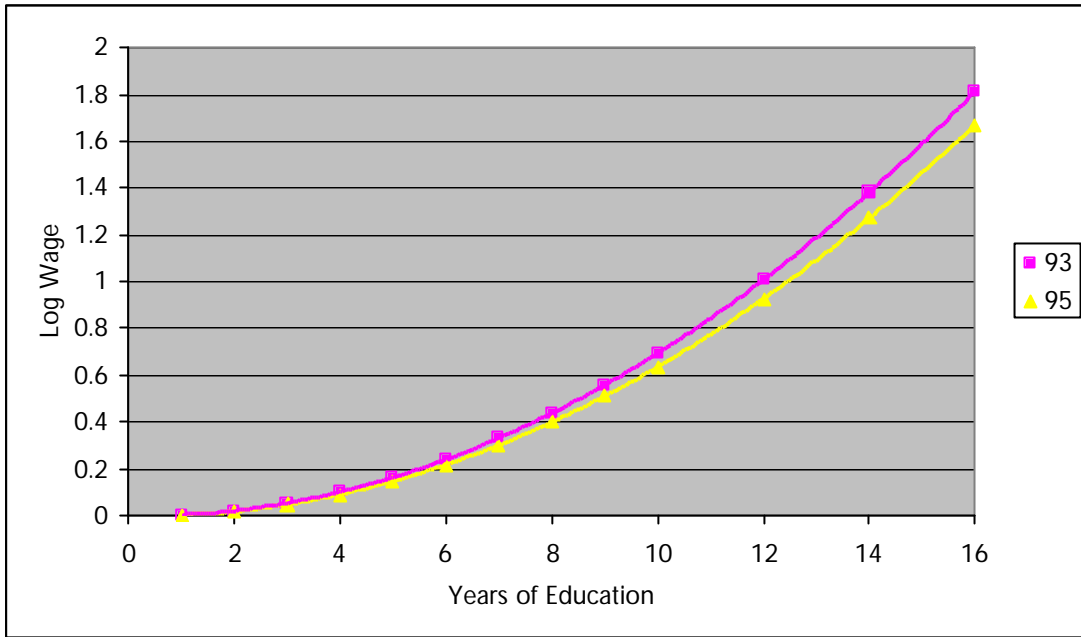


Figure 3: Male wage-experience profile

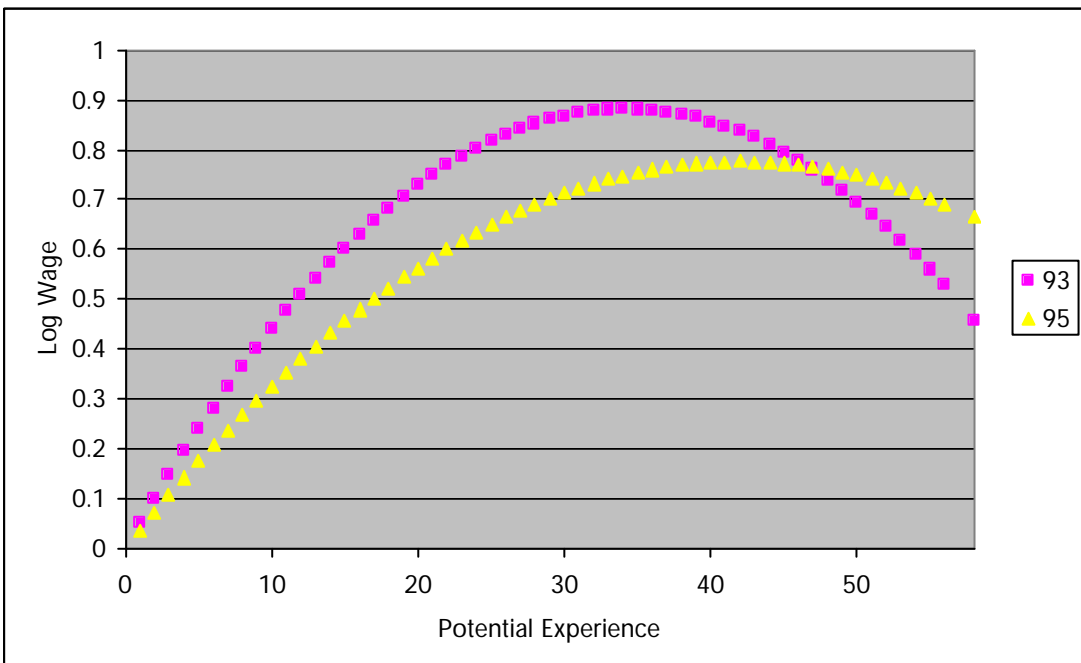


Table 2 displays the results of the all-males weighted earnings regression. Given the semi-logarithmic form of the earnings function, the interpretations of the coefficients are especially convenient: the coefficient of a given continuous variable measures the constant proportional or relative change in the dependent variable for a given absolute change in the value of that independent variable¹⁰ (Gujarati 1995).

The estimated coefficients of the dummy variables are also easily interpreted if Halvorsen and Palmquist's (1980) rule is applied: "Take the antilog of the estimated dummy coefficient and subtract one from it." Applying this rule, the coefficients of the dummy variables express the relative change in the mean value of the dependent variable when the value of the relevant dummy variable changes from zero to one. Transformed values for the dummy coefficients according to Halvorsen and Palmquist's rule are reported in Table 2 in the column labelled "Dum Int."

The influence of education and potential experience on wages is illustrated in Figures 2 and 3, respectively. These figures are created by imposing a second order polynomial relation using the estimated coefficients for education and education squared, and experience and experience squared, respectively, as reported in Table 2. The values of all other coefficients are disregarded. Figure 2 shows that education has positive and increasing returns effects on wages.¹¹ The impact of education on wages seems to be more or less constant in magnitude across the two periods, 1993 and 1995. Similarly, Figure 3 relates potential experience to wages in a manner consistent with human capital theory in both the periods.

The results reported in Table 2 enable the rejection of the hypothesis that urban and rural locations yield identical wages. Rural location is associated with lower earnings but the negative impact of rural location on earnings is less severe in 1995 compared to 1993. The economic rationale underlying this result is not clear. Based on the regression results, it can be argued that union members earn more than the non-unionised members. The coefficient for union members is insignificant (5 per cent level) for the 1993 data, but based on 1995 data the coefficient is significant and indicates that union members earn 11 per cent more than non-unionised employees.

Using the manufacturing industry as the base case (and holding all other variables constant), it is observed that employees in the agriculture, wholesale and service industries earned significantly less than employees in the manufacturing industry, both in 1993 and 1995. Furthermore, wages are lower in the construction industry, while employees in electricity and transport industries earn higher wages than in the manufacturing industry; however, these three results are statistically significant only in 1995. The coefficient for the mining industry dummy changes sign from 1993 (positive) to 1995 (negative), but it is insignificant for both years. Both finance sector coefficients are positive but insignificant.

Unskilled occupations were used as the base case and, as expected, all other occupations earn higher incomes, except for agricultural occupations in 1993. The coefficient for the agricultural occupational dummy further changes sign as we move from 1993 to 1995 data. The changing

¹⁰ An example using a single regression model illustrates this point.

$$\ln(W) = \mathbf{a} + \mathbf{b}X \Leftrightarrow W = e^{\mathbf{a}} e^{\mathbf{b}X} \text{ The derivative of } \ln(W) \text{ with respect to } X \text{ equals } \mathbf{b} .$$

$$\text{The derivative of } W \text{ with respect to } X \text{ is given by: } \partial W / \partial X = e^{\mathbf{a}} e^{\mathbf{b}X} \mathbf{b} = W\mathbf{b}$$

$$\text{Thus } \partial \ln(W) / \partial X = \mathbf{b} = W^{-1} \partial W / \partial X$$

¹¹ Table 2 shows that the coefficient on the years of education variable is insignificant in both 1993 and 1995. However, the quadratic term (years of education squared) is significant and as noted earlier, according to the appropriate Wald test the two variables are jointly significant. A quadratic relationship between wages and education may exist even if the years of education variable is omitted, as in the following simplified equation: $wage = a + b \cdot ed^2$ (where a and b are constants).

sign can again be explained by the altered definition of agricultural occupations in 1995. As mentioned before, agricultural occupations in 1995 included only skilled agricultural workers. It is interesting to note further that in both years the managerial category exhibits the highest income – even higher than the professional category. This might be explained by the fact that the professional category includes associate professionals and technicians who are paid significantly less than the category mean.

Most coefficients for individual provincial dummies are insignificant. But it can be noted that employees with residential status in the Free State earn less than workers in KwaZulu Natal. The 1995 regression indicates that Gauteng workers earn 9 per cent more than employees in KwaZulu Natal. However, given the potential problems with this variable discussed earlier, not much reliance should be placed on these results.

From Table 1 the estimated observed wage gap between the individual racial groups and the overall male mean wage can be computed.¹² Furthermore, we can derive the estimated productivity component of the wage gap based on the coefficients from the all-male earnings regression reported in Table 2 and the difference between the overall mean characteristics and the mean characteristics of the various races (see equation (29)). These results are reported in Table 3.

Table 3: Decomposition of male earnings differentials

Year	1993				1995			
Race	African	Coloured	Asian	White	African	Coloured	Asian	White
\hat{g}_g	-0.369	-0.020	0.846	2.960	-0.273	-0.211	0.858	2.390
\hat{q}_g	-0.325	0.084	0.940	1.913	-0.187	-0.221	0.669	1.297
$\hat{d}_g (\hat{q}_g + 1)$ ¹³	-0.045	-0.105	-0.094	1.047	-0.086	0.011	0.189	1.093
\hat{d}_g	-0.066	-0.097	-0.049	0.360	-0.106	0.014	0.113	0.476

The coefficient $\hat{g}_g = \frac{\hat{W}_g - \hat{W}}{\hat{W}}$ expresses group g's mean wage relative to the mean wage of the whole sample (all males), and thus defines the gross wage differential.

The coefficient $\hat{q}_g = \frac{\hat{W}_g^0 - \hat{W}^0}{\hat{W}^0}$ expresses group g's non-discriminatory mean wage relative to the non-discriminatory mean wage of the whole sample, and therefore defines the productivity differential.

$\hat{d}_g (\hat{q}_g + 1) = \frac{\hat{W}_g - \hat{W}_g^0}{\hat{W}_g^0} \left(\frac{\hat{W}_g^0}{\hat{W}^0} \right) = \frac{\hat{W}_g - \hat{W}_g^0}{\hat{W}^0}$ similarly shows the difference between group g's mean wage and non-discriminatory wage relative to the non-discriminatory wage of the whole

¹² The wage gap is estimated in the sense that mean values are computed for the whole sample and for individual racial groups.

¹³ $\hat{q}_g + \hat{d}_g (\hat{q}_g + 1) = \frac{\hat{W}_g - \hat{W}^0}{\hat{W}^0} = \hat{g}_g$ assuming $\hat{W}^0 = \hat{W}$. $\hat{d}_g (\hat{q}_g + 1)$ is thus computed as the difference between \hat{g}_g and \hat{q}_g .

sample. $d_g(q_g + 1)$ therefore expresses the discrimination differential. For a given group, comparing $d_g(q_g + 1)$ with d_g as defined by equation (10), we see that the former relates the proportional difference between the actual mean wage and the non-discrimination mean wage to the pooled mean wage, while d_g is the same difference expressed as a proportion of the mean wage of its own group.

Table 3 illustrates South Africa's wage ranking, in which Africans earned the least and Whites the most. Africans, Coloureds, Asians and Whites respectively earned 37 per cent below, 2 per cent below, 85 per cent above and 296 per cent above the 1993 mean male monthly wage of R1128¹⁴. Of this African gross wage differential, 88 per cent can be explained by productivity differences. The remaining 12 per cent of the gross wage differential can be interpreted as discrimination in the form of underpayment. Based on productivity characteristics, Coloureds were expected to earn more than the average male wage. Thus, Coloureds were also subject to some underpayment. Table 3 indicates that Asians were underpaid. Although Asians received 85 per cent above the average male wage, they would have been paid even more in the absence of discrimination, reflecting their superior productivity. Whites earn 296 per cent above the male mean wage. Of the White wage differential, 65 per cent is due to above average productivity characteristics. The remaining 35 per cent of the wage differential results from Whites being overpaid.

Corresponding numbers for 1995 indicate that the wage ranking among races remained unaltered. In 1995, Africans earned 27 per cent less than the mean wage of R1305. Of this wage differential, some 68 per cent is explained by productivity differences. Thus the residual, comprising the discrimination component, increased for Africans between 1993 and 1995. The estimations suggest that Coloureds earned less compared to the overall mean wage in 1995 than in 1993. But in contrast to 1993, these below average payments are *more* than accounted for by the below average productivity characteristics. The data thus suggest that Coloureds were overpaid in 1995. Asians and Whites earned respectively 85 per cent and 239 per cent more than the mean male wage. Some 78 per cent and 54 per cent of the Asian and White wage differential respectively can be explained by above average productivity characteristics.

Comparing the magnitudes of the discrimination coefficient d_g for 1993 and 1995, we find that discrimination declined only in the Coloured group. In relative terms Africans were more extensively underpaid in 1995, Whites were overpaid relatively more, and Asians changed from experiencing underpayment to overpayment. These results thus *contradict* the argument that in South Africa the long-term trend has been declining discrimination (Moll 1998, Hinks 1999).¹⁵ On the other hand our findings are consistent with previous work based on post-apartheid data sets. For example, Hinks and Allanson (2000), using the OHS95 and OHS97 surveys, also fail to find that discrimination is declining for all racial groups.

4.2 Females

Estimates for the female sub-sample are produced in the same fashion as for males. Interpretations of results are thus the same for females as for males. From Table 4, it can be observed that the overall nominal mean wage increased between 1993 and 1995, and an increase in mean wages is evident for all racial groups.

¹⁴ The male mean monthly wage equals $e^{7.028} = 1127.77$

¹⁵ It should be noted, however, that these authors did not use identical methods to estimate discrimination coefficients.

The mean number of years of education increased both for all females and for each racial group. As for males, the increase in education was most substantial for Africans. In contrast to males, however, females exhibited less potential experience in 1995 than in 1993. Decreased potential experience is consistent with what one might expect due to the construction of the experience variable (since $\text{experience} = \text{age} - \text{years of education} - 6$). Asians violate the pooled sample trend, having more experience in 1995 than in 1993. The data suggest that females in general were also subject to urbanisation and increasing union membership, but that Coloureds and Asians deviated from this pooled sample pattern.

The sectoral distribution of female employees remained more or less constant between 1993 and 1995. However, in terms of occupational categories a female-specific trend is noticeable, namely movements from service occupations (e.g. domestic service) into clerk and sales occupations. As for males, a decrease in agricultural occupations and an increase in unskilled occupations are observed. A likely explanation is the differing definitions of agricultural occupations in the two surveys already noted.

Considerable movements between provinces are also observed for females. The main tendencies are similar for both genders, in that the figures in Table 4 indicate movements out of Mpumalanga and North West Province and into Gauteng and Free State. But as before, certain reservations about the reliability of these figures are pertinent.

Table 5 displays the results from the pooled weighted earnings regression for females. The influence of education and potential experience on wages is illustrated in Figures 4 and 5, respectively. As for males, a second order polynomial relationship between wages and education/experience is imposed, using the estimated coefficients from the earnings functions and disregarding all other estimated values. From Figure 4, we see that earnings are positively related to years of education. Furthermore, marginal returns to education are increasing.¹⁶ The wage-experience profile exhibits similar patterns to those suggested by human capital theory, although one can observe that the peak of the 1993 wage-experience profile corresponds to a much lower number of years of experience than the peak of the 1995 profile. One possible explanation for this is that females on average had higher levels of educational attainment in 1995, which tends to delay the peak of the wage-experience profile.

Rural location reduced earnings by 28 per cent in 1993 and by 16 per cent in 1995. Union membership had a positive influence on earnings. In 1993, union membership increased monthly earnings by 29 per cent while this increment was reduced to 14 per cent in 1995.

Among sectoral categories, estimations suggest that workers in primary, mining, wholesale, and service sectors generally earned less than those in manufacturing. Further, workers in electricity, transport and finance sectors earned more than manufacturing workers. However, some of the coefficients are not statistically significant, most notably for the mining sector. The coefficient for the construction industry changes sign from 1993 to 1995, but this coefficient is also insignificant for both years.

Defining unskilled occupations as the base case, it is observed that almost all other occupations yielded higher earnings. The exception was agricultural occupations in 1993. This coefficient further changed sign from 1993 (negative) to 1995 (positive), which again can be explained by the fact that agricultural occupations included only skilled workers in OHS95 while all agricultural workers were included in SALDRU93.

¹⁶ Table 4 shows that the coefficient on the years of education variable is insignificant in 1993, but the quadratic term (years of education squared) is significant and as noted earlier the two variables are jointly significant. As mentioned in footnote 11 in the context of the male regressions, a quadratic relationship between wages and education may still exist even if the years of education variable is omitted.

Most of the individual dummy variables for provinces are insignificant. Only the coefficient for Gauteng is significant for both years and the positive sign indicates that residents of Gauteng enjoyed higher earnings, on average.

Figure 4: Female wage-education profile

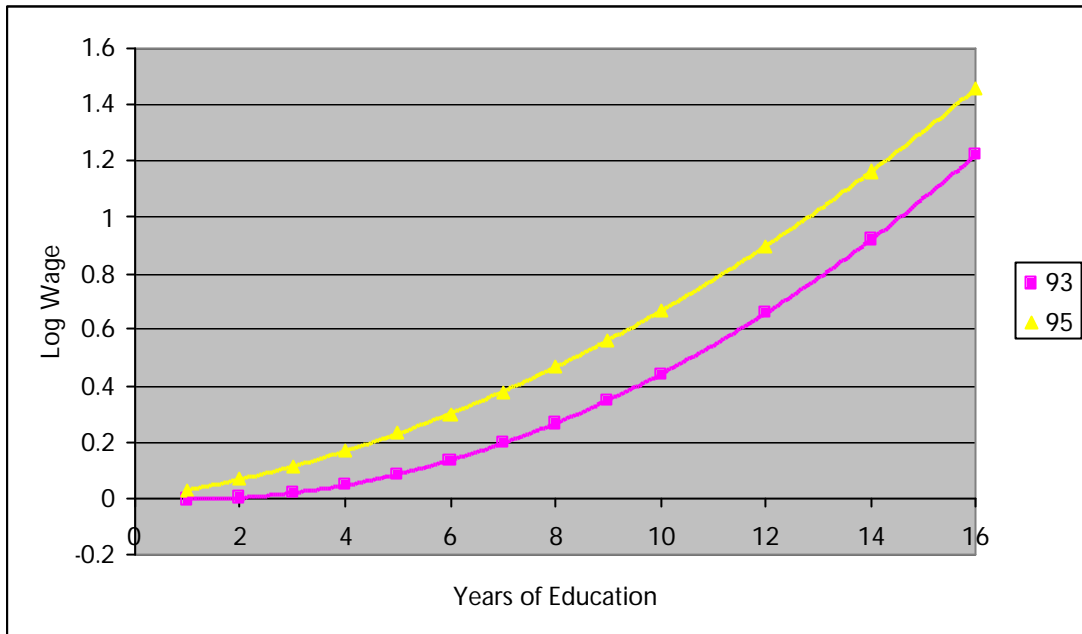


Figure 5: Female wage-experience profile

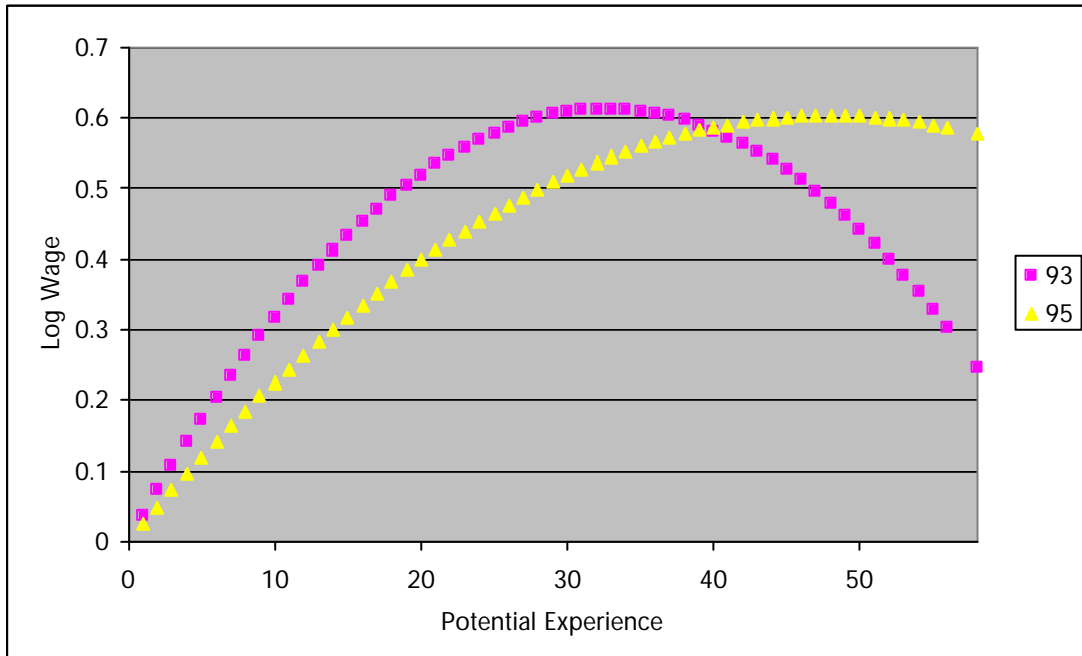


Table 4: Female weighted mean sample characteristics

Variable Name	Code	1993 Mean Values					1995 Mean Values				
		All	African	Coloured	Asian	White	All	African	Coloured	Asian	White
Log Gross Mth Wage	Inwage	6.646	6.211	6.729	7.159	7.739	7.170	6.932	6.907	7.504	7.831
Years of Education	yrshed	8.438	7.403	8.190	10.899	11.087	10.097	9.300	9.220	11.146	12.313
Years of Ed Squared	yrshedsq	89.717	72.821	78.616	127.015	139.447	116.216	103.786	95.420	132.434	154.787
P. Work Experience	exp	20.681	22.660	19.226	14.864	17.464	19.726	21.557	17.257	15.492	17.415
P. Work Exp Squared	expsq	568.258	654.503	479.003	360.448	437.358	520.303	594.778	409.062	350.876	431.862
Rural	locdum1	0.391	0.602	0.122	0.011	0.081	0.257	0.384	0.147	0.035	0.052
Urban	locdum2	0.609	0.398	0.878	0.989	0.919	0.743	0.616	0.853	0.965	0.948
Member	uniond1	0.231	0.206	0.436	0.416	0.093	0.315	0.374	0.295	0.361	0.177
Not Member	uniond2	0.769	0.794	0.564	0.584	0.907	0.685	0.626	0.705	0.639	0.823
Agric/Fish/Forest/Hunt	inddum1	0.106	0.137	0.134	0.000	0.017	0.087	0.114	0.141	0.004	0.006
Mining/Quarrying	inddum2	0.008	0.007	0.000	0.000	0.021	0.008	0.009	0.000	0.011	0.010
Manufacturing	inddum3	0.154	0.131	0.268	0.449	0.054	0.154	0.143	0.245	0.336	0.101
Electricity	inddum4	0.004	0.001	0.000	0.011	0.016	0.005	0.003	0.003	0.000	0.011
Construction	inddum5	0.012	0.011	0.012	0.011	0.016	0.008	0.004	0.004	0.013	0.019
Wholesale	inddum6	0.162	0.131	0.219	0.135	0.213	0.224	0.217	0.267	0.205	0.220
Transort	inddum7	0.032	0.020	0.012	0.011	0.091	0.013	0.007	0.007	0.021	0.028
Finance	inddum8	0.045	0.015	0.012	0.056	0.157	0.097	0.044	0.061	0.123	0.238
Service	inddum9	0.477	0.547	0.343	0.326	0.415	0.404	0.458	0.271	0.285	0.367
Professional	occdum1	0.176	0.166	0.131	0.180	0.242	0.246	0.256	0.114	0.245	0.294
Manager	occdum2	0.047	0.005	0.008	0.034	0.204	0.017	0.010	0.011	0.018	0.038
Clerk & Sale	occdum3	0.205	0.105	0.201	0.405	0.454	0.323	0.209	0.294	0.439	0.591
Service	occdum4	0.209	0.315	0.038	0.056	0.069	0.086	0.100	0.119	0.024	0.045
Agriculture	occdum5	0.043	0.072	0.004	0.000	0.000	0.002	0.002	0.004	0.000	0.000
Craft & Trade	occdum6	0.015	0.009	0.023	0.056	0.013	0.029	0.032	0.042	0.065	0.009
Skilled Worker	occdum7	0.098	0.084	0.210	0.258	0.010	0.058	0.060	0.107	0.157	0.011
Unskilled Worker	occdum8	0.208	0.243	0.385	0.011	0.008	0.239	0.331	0.308	0.052	0.011
Western Cape	provdum1	0.207	0.045	0.745	0.000	0.305	0.135	0.027	0.661	0.024	0.121
Northern Cape	provdum2	0.013	0.004	0.067	0.000	0.000	0.012	0.005	0.039	0.000	0.016
Eastern Cape	provdum3	0.098	0.120	0.075	0.000	0.075	0.113	0.144	0.086	0.016	0.069
KwaZulu/Natal	provdum4	0.189	0.180	0.106	0.989	0.077	0.187	0.214	0.046	0.770	0.104
Free State	provdum5	0.013	0.021	0.000	0.000	0.000	0.056	0.069	0.015	0.000	0.056
Mpumalanga	provdum6	0.131	0.186	0.003	0.011	0.103	0.046	0.064	0.004	0.003	0.034
Northern Province	provdum7	0.084	0.114	0.000	0.000	0.087	0.057	0.087	0.011	0.000	0.018
North West	provdum8	0.110	0.165	0.000	0.000	0.063	0.071	0.097	0.009	0.003	0.053
Gauteng	provdum9	0.156	0.165	0.003	0.000	0.290	0.324	0.294	0.131	0.183	0.528
Sample Size		1570	957	259	89	265	5822	3272	1090	306	1154

Table 5: Female Earnings Regression

Variable	1993 Female Earnings Regression					1995 Female Earnings Regression					
	Coef.	Std. Err.	t	P> t	Dum Int	Coef.	Std. Err.	t	P> t	Dum Int	
yrsed	-0.010	0.019	-0.509	0.612		0.026	0.009	2.728	0.010		
yrse dsq	0.005	0.001	4.365	0.000		0.004	0.001	7.698	0.000		
exp	0.037	0.005	7.898	0.000		0.025	0.003	9.086	0.000		
expsq	-0.001	0.000	-5.772	0.000		0.000	0.000	-4.320	0.000		
locdum1	-0.327	0.074	-4.427	0.000	-0.279	-0.177	0.022	-8.201	0.000	-0.162	
locdum2	0.000	Base Case				0.000	Base Case				0.000
uniond1	0.258	0.040	6.459	0.000	0.294	0.133	0.015	8.658	0.000	0.142	
uniond2	0.000	Base Case				0.000	Base Case				0.000
inddum1	-0.379	0.092	-4.136	0.000	-0.315	-0.611	0.059	-10.326	0.000	-0.457	
inddum2	-0.016	0.179	-0.087	0.931	-0.015	-0.012	0.168	-0.070	0.945	-0.012	
inddum3	0.000	Base Case				0.000	Base Case				0.000
inddum4	0.696	0.183	3.801	0.000	1.006	0.153	0.094	1.630	0.113	0.165	
inddum5	-0.125	0.247	-0.506	0.613	-0.118	0.058	0.137	0.424	0.675	0.060	
inddum6	-0.075	0.058	-1.308	0.192	-0.072	-0.255	0.033	-7.834	0.000	-0.225	
inddum7	0.235	0.088	2.665	0.008	0.265	0.039	0.087	0.446	0.659	0.040	
inddum8	0.165	0.075	2.195	0.029	0.179	0.122	0.032	3.878	0.000	0.130	
inddum9	-0.224	0.055	-4.073	0.000	-0.201	-0.033	0.032	-1.036	0.308	-0.033	
occdum1	1.452	0.086	16.976	0.000	3.272	0.698	0.026	27.039	0.000	1.009	
occdum2	1.359	0.098	13.795	0.000	2.890	0.827	0.079	10.453	0.000	1.288	
occdum3	0.865	0.077	11.207	0.000	1.376	0.497	0.024	20.909	0.000	0.644	
occdum4	0.119	0.075	1.586	0.114	0.126	0.176	0.038	4.613	0.000	0.192	
occdum5	-0.140	0.135	-1.040	0.299	-0.131	0.113	0.103	1.096	0.281	0.119	
occdum6	0.490	0.219	2.234	0.026	0.633	0.053	0.061	0.869	0.392	0.055	
occdum7	0.410	0.069	5.980	0.000	0.507	0.159	0.029	5.444	0.000	0.172	
occdum8	0.000	Base Case				0.000	Base Case				0.000
provdum1	0.210	0.060	3.512	0.001	0.234	0.026	0.045	0.578	0.567	0.026	
provdum2	-0.178	0.138	-1.292	0.198	-0.163	-0.203	0.041	-4.892	0.000	-0.184	
provdum3	-0.030	0.091	-0.330	0.742	-0.029	-0.139	0.033	-4.278	0.000	-0.130	
provdum4	0.000	Base Case				0.000	Base Case				0.000
provdum5	-0.258	0.281	-0.920	0.358	-0.228	-0.377	0.056	-6.720	0.000	-0.314	
provdum6	-0.146	0.090	-1.617	0.107	-0.136	-0.025	0.049	-0.518	0.608	-0.025	
provdum7	-0.002	0.085	-0.029	0.977	-0.002	-0.017	0.040	-0.417	0.679	-0.017	
provdum8	0.054	0.104	0.517	0.606	0.055	-0.085	0.046	-1.853	0.073	-0.082	
provdum9	0.211	0.079	2.675	0.008	0.235	0.176	0.032	5.537	0.000	0.193	
_cons	5.389	0.123	43.756	0.000		5.804	0.066	87.478	0.000		

F = 95.24
R-squared = 0.70
N = 1570

F = 6396
R-squared = 0.66
N = 5822

Based on the estimated mean values in Table 5, the observed wage gap between each racial group and the whole sample of females can be determined. Then, using the regression coefficients for all females and the differences in mean values between each racial group and the entire female sample, we can estimate the productivity component of the observed wage gap. These results are presented in Table 7.

Table 7: Decomposition of female earnings differentials

Year Race	1993				1995			
	African	Coloured	Asian	White	African	Coloured	Asian	White
\hat{g}_g	-0.352	0.086	0.670	1.984	-0.212	-0.231	0.396	0.936
\hat{q}_g	-0.304	0.087	0.659	1.410	-0.143	-0.232	0.246	0.617
$\hat{d}_g(\hat{q}_g + 1)$	-0.049	-0.001	0.011	0.574	-0.069	0.002	0.150	0.319
\hat{d}_g	-0.070	-0.001	0.007	0.238	-0.080	0.002	0.121	0.197

The 1993 results support the notion of a South African wage hierarchy where Whites earn the most and Africans the least. The comparable figures for 1995 indicate that the wage ranking had changed. From 1993 to 1995 Coloureds and Africans had swapped places in the wage hierarchy with Coloured women then earning the least. Africans, Coloureds, Asians and Whites respectively earned 35 per cent less, and 8.6 per cent, 67 per cent and 198 per cent above the average monthly wage of R770.¹⁷ For Africans, 86 per cent of the negative wage gap can be explained by below average productivity characteristics while the remaining component potentially reflects discrimination. Productivity characteristics below average explain almost fully the observed wage gap for Coloureds and Asians. For Whites, productivity characteristics explain roughly 71 per cent of the wage differential.

Moving to 1995, African, Coloured, Asian and White women earned respectively 21 per cent less, 23 per cent less, 40 per cent more and 94 per cent more than the average monthly wage of R1300.¹⁸ The components of the wage gaps, negative or positive, explained by productivity characteristics were respectively for Africans, Coloureds, Asians and Whites some 67 per cent, 100 per cent, 62 per cent and 66 per cent.

Based on our estimations, Whites were the only group for which the unexplained component of the wage gap decreased. Thus, it is on behalf only of Whites that we can argue that discrimination declined. For the other racial groups, discrimination potentially increased. This fact is reflected in the values for the discrimination coefficient (\hat{d}_g) for the two years. The difference in the absolute value of the discrimination coefficient between 1995 and 1993 is negative only for Whites.

¹⁷ $e^{6.646} = 770$

¹⁸ $e^{7.170} = 1300$

Conclusion

In most academic work, the results obtained hinge to an important degree on underlying assumptions. The present paper is no exception to this rule. The important assumptions will thus be summarised before major findings are pointed out.

The focus has been on discrimination on grounds of race among full-time wage earning employees. Other forms of discrimination, some of which are labelled pre-labour market discrimination, have at best been controlled for (e.g. dummy variables for occupational categories) and at worst not controlled for owing to lack of data (e.g. varying quality of education). Further, the decomposition method we applied estimates discrimination as a residual between observed wage differentials and the component of such differentials explained by productivity characteristics. Any misspecification of the earnings functions will thus induce bias into the discrimination estimates. A more fundamental assumption of the decomposition methodology is that the presence of discrimination has only distributional effects. In other words, the wage bill is assumed to be the same irrespective of whether discrimination is present or not. This in turn presupposes that factor payments are wholly and consistently in accordance with marginal productivities, and thus that factor markets work perfectly. Clearly, in the South African context, this assumption is rather heroic.

To make discrimination estimates operational, one needs a notion of what the wage structure would be like in the absence of discrimination. In the present paper, average characteristics based on a pooled sample containing all racial groups are used as a proxy for the non-discriminatory wage structure.¹⁹ Lastly, certain ad hoc assumptions were unavoidable when attempting to make data from 1993 congruent with data from 1995.

African males were subject to discrimination showing up in the form of underpayment in both 1993 and 1995. However, the largest share of the observed wage differential for this group was due to their below average productivity characteristics. For Coloured and Asian males, substantial wage differentials were mostly explained by above or below average productivity characteristics (relative to the average male worker). An exception was found for Asian males in 1995, for whom above average productivity characteristics accounted for some 78 per cent of the observed wage differential. Based on discrimination coefficients, it was found that (positive) discrimination was most remarkable towards white males. Whites were overpaid, illustrated by the fact that in 1993 and 1995, productivity characteristics could explain no more than approximately 65 per cent and 54 per cent of the observed wage differential, respectively.

Among females, discrimination exhibits similar patterns to those found for males. Differing group productivity when compared to the average female worker, explains by far the largest portion of the observed wage differentials for Africans, Coloureds and Asians. But differential productivity as the explanatory force is not as weighty among Africans as among Coloureds and Asians. The results for Asian females in 1995 are an exception. In 1995, Asian productivity differences from the mean accounted for only 62 per cent of the wage differential. Again, the data suggest that the most striking discriminatory effect is defined by White overpayment. For White females, above average productivity characteristics accounted for 71 per cent and 66 per cent of the wage differential in 1993 and 1995, respectively.

In sum, using data from 1993 and 1995, variation in discrimination trends between racial groups seems to be the rule. At the least, we cannot yet conclude that discrimination is declining as an overall trend for all racial groups. But what do the differences when comparing the 1993 results with the 1995 results really reflect? Two possible explanations seem plausible: the

¹⁹ *Discriminatory wages are present in the pooled sample.*

differences reflect either changes over time or data inconsistencies. If the time span of two years is too short to pick up considerable changes in the underlying wage structure, then variation in discriminatory trends probably reflects data inconsistencies. A more likely scenario is that changing discrimination coefficients incorporate both changes over time and problems with the data. Unfortunately, it is not clear how to separate these effects. Despite these problems, one finding stands out, namely that Whites are overpaid relative to their measured productivity. However, some of this effect could be due to superior quality of education, which is not controlled for. Perhaps the major challenge for any future discrimination estimates is to control for differential quality of education.

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