

## Wage effects of labour-market experience and firm tenure for South African black and white workers

Rulof P. Burger and Kholekile Malindi

### Abstract

*The paper offers an empirical analysis of the relative contribution of labour market experience and firm tenure on individual worker wage growth for South African black and white workers. Our base specification finds that an additional year of firm tenure contributes more to average wage growth of black workers and that white workers derive much greater wage growth from an additional year of labour market experience. And that black women have the largest estimated returns to firm tenure and the smallest returns to labour market experience. These results, however, seem to be largely driven by greater uncertainty around the expected productivity of black workers and unobservable heterogeneity in the quality of worker-firm matches.*

KEYWORDS: Income mobility, inequality, longitudinal data analysis, measurement error

JEL CODES: J62, D63, C23

The **Research Project on Employment, Income Distribution and Inclusive Growth** is based at SALDRU at the University of Cape Town and supported by the National Treasury. Views expressed in REDI3x3 Working Papers are those of the authors and are not to be attributed to any of these institutions.



# Wage effects of labour-market experience and firm tenure for South African black and white workers

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## 1. Introduction

Time spent in the labour market and time with an employer or in a specific position allows a worker to accumulate skills that, according to the human capital model, play an important role in determining the worker's earnings. These skills, together with the skills learned at school in preparation for entry into the labour market, enable the worker to be more productive and thus improve the earnings potential of the worker. The developing country literature on earnings has tended to focus more on the role of schooling as a source of skills and on its role in determining individual earnings. In this paper, attention is given to labour market experience and firm tenure in our attempts to fill the gap in the literature on earnings in South Africa and developing country context more generally. We are specifically interested in knowing what happens to wages as a worker accumulates an additional year of labour market experience or when the worker is employed with the same employer for an additional year. We estimate these effects for black and white men and women in the South African labour market.

Studying the wage effects of labour market experience and employment tenure is important for two more other reasons. Firstly, the wage-experience and wage-tenure profiles are two key components of the dynamic structure of wages (Williams, 1991) and thus are important in understanding how individual wages grow over time. How an individual's wages grow relative to average wages in the country is of great importance in the South African labour market because wage inequality has been identified as the key driver of South Africa's stubbornly high income inequality (Leibbrandt et al, 2010; Van der Berg, 2014). Secondly, studying the returns to labour market experience and firm tenure may also add to our understanding of the costs of (youth) unemployment since unemployed individuals while unemployed forgo the opportunity to acquire or increase their skills and thus their future earnings are less than what they could have been.

An analysis of the wage effects of on-the-job training will require us to estimate and interpret an earnings regression with labour market experience and firm tenure as the key variables of interest. But the estimation of the casual effect of labour market experience and firm tenure is complicated by

the existence of unobserved heterogeneity in the quality of individual workers and in the quality of worker-firm matches (Abraham and Farber, 1987; Altonji and Shakotko, 1987; Garen, 1989; and Topel, 1991). The complication arises because the unobserved heterogeneity is correlated to labour market experience and employment tenure, and introduces bias in the estimation of these variables. A further complication arises because of the lack of direct measures of actual labour market experience in the data sets we have available to analyse the South African labour market. A common solution which has become standard practice is to proxy for actual experience with potential experience measured as age minus years of schooling minus 6 (Mincer, 1974). But during periods of rising unemployment, a wedge is driven between actual and potential experience, which makes it even more difficult to accurately estimate the casual effects of experience and employment tenure. This paper endeavours to address these challenges by using data and estimators that explicitly address the abovementioned challenges.

## 2. Literature review

This paper focuses on two key components of wage growth – returns to employment tenure and returns to labour market experience<sup>1</sup> – and their effect on the racial and gender earnings gap over the life-cycle. The literature on individual wage growth is dominated by the human capital model that places skills accumulation and productivity over the life cycle as the key explanation for wage growth. An alternative explanation is advanced by the sorting, learning and matching models that emphasise the importance of imperfect information, implicit contracts and principal-agent considerations in the employer-employee relationship that bring about wage growth over the life-cycle. In this section we summarize this large literature without any attempts of being exhaustive.

A key distinction underlying the differences in the human capital model and the second group of models is the role assigned to individual worker productivity growth as the key driving force behind the observed pattern of individual wages over the life-cycle. As such we will classify the different models into *productivity-based* and *non-productivity based* models.<sup>2</sup> This is a crude classification that groups models based on their reliance and emphasis, or lack thereof, on productivity growth as the key driving force behind the growth of individual wages over the life-cycle. This classification is used here mainly as a tool for organising the different models to be discussed. We begin the discussion with the human capital model followed by the *non-productivity based* models. We conclude the

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<sup>1</sup> Attention here is restricted to the post-schooling phase of the life-cycle, in other words we do not consider experience and tenure accumulated while at school that has been identified as being important in accurately estimating the returns to schooling and labour market experience by Light and Ureta (1995) and Light (1998).

<sup>2</sup> This classification is adopted from Harris and Holstrom (1982).

section with a brief review of the South African literature on wage growth inferred from studies utilising earnings functions.

## **2.1 Productivity-based models**

Under the human capital model, schooling and on-the-job training are two channels through which individuals make productivity-enhancing investments. Schooling teaches skills to individuals in preparation for entry into the labour market. Skills learned at school are then adapted, enhanced, and new ones acquired while on the job (Becker, 1962). The increased stock and efficiency of skills enables the worker to be more productive. This in turn improves the worker's earnings potential since, under this model, wages are assumed to reflect a worker's productivity.

Becker (1962) argued that an individual will devote a large portion of his initial stages of the life cycle investing in human capital. This is because young individuals have a longer expected working period over which to collect the returns on their investments. Subsequent stages will be characterised by gradual decreases in investments until no further investments are made. The rate of investment declines because the opportunity cost of further investments increases and also because the working period over which to enjoy the benefits of further investments becomes shorter and shorter. Further theoretical work by Ben-Porath (1967) illustrated that these incentives produce life-cycle productivity profiles that are concave.

The human capital model enjoys a great deal of empirical support. Seminal contributions by Altonji and Shakotko (1987), Topel (1991) and Altonji and Williams (2005) are among a large group of papers that provide empirical support for the importance of firm tenure and general labour market experience for wage growth. More recent studies contend that skill accumulation is not simply firm-specific or general; these studies illustrate the importance of occupation and industry experience in the accumulation of skills and determining individual worker wage growth over the life cycle (Neal, 1995; Parent, 2000; Sullivan, 2010; and Nawakitphaitoon, 2014).

## **2.2 Non-productivity based models**

Other theoretical models have made similar predictions about the growth of individual wages over the life-cycle, but with different explanations regarding the process underlying the growth of wages. In Jovanovic's (1979) job matching model of labour turnover, the productivity of a given worker in a given job is unknown *ex ante* by neither employer nor employee and this gives rise to uncertainty about the quality of the worker-firm match. This uncertainty is resolved through a learning process in which the worker's output is observed by the firm over time. Firms value workers with whom they are well matched with and will offer higher wages to such workers, while paying relatively lower

wages to workers who are revealed to be of low productivity and a poor match with the firm. Thus individual wages are an increasing function of employment tenure because workers that are well matched will accumulate longer tenure spells while poorly matched workers move on to other firms. Wages are also predicted to increase with labour market experience since tenure is correlated with labour market experience, and worker movements are expected to result in improved matches over the life-cycle.

In Salop and Salop's (1976) model, it is shown that firms offer wages that increase with tenure over the life cycle as a self-selection mechanism that ensures the credibility of information conveyed by job applicants. Faced with high turnover costs when employees quit, the firm would ideally like to employ those employees with lower inclinations to leave the firm prematurely. By offering initially low – but predictably increasing – wages, the firm induces workers to reveal their privately held quit-propensities and ensures that workers with high quit-propensities self-select themselves out of jobs offering upwardly-sloping wage-tenure profiles. This implies that wages may increase with tenure independently from productivity increases.

The above models emphasise the importance and consequences of imperfect information in the employer-employee relationship. The next model demonstrates that positively sloped wage-earnings profiles may also be accounted for by firms' attempts at overcoming principal-agent problems that often characterise an employer-employee relationship. In Lazear's (1981) model, it is showed to be an optimal strategy for a firm to pay lower wages in the early stages of the life cycle or pay junior workers less than their senior counterparts. This incentivises less shirking on the job and ensures that workers supply optimal levels of effort.

While the explanations for individual worker wage growth over the life-cycle may differ, the prediction that individual wages increase with additional years of both tenure and experience is well grounded in theoretical models and enjoys a great deal of empirical support.

### **2.3 South African literature**

The theoretical literature reviewed above is mainly based on the United States of America (or more generally on a developed country context). Developing country labour markets are different in interesting ways that may influence the way we conceptualise and interpret many labour market theories and the way we empirically estimate those theories. With the greater policy focus on schooling and its role in determining earnings, there has been little research focus in developing countries on the wage effects of employment tenure and labour market experience.

In the South African context, earnings functions have played a key role in helping researchers to better understand the dynamics of the South African labour market. This research usually involves estimating and interpreting earnings functions to identify and explain factors that determine wages. This research can broadly be grouped into studies that focus on the effects of schooling on wages (see for example Keswell and Poswell, 2004; and Mwabu and Schultz, 2000), and studies that focus on earnings inequality between groups of workers (see for example Allanson et al, 2002; Grun, 2004; Rospabe, 2002; and Sherer, 2000).

Unfortunately, there is very little that can be inferred about the causal effect of tenure and experience from these studies. This is because tenure and experience are included in the earnings functions as control variables and as such no attempts are made to address any bias that might affect the estimates of these parameters. In this analysis we attempt to fill this void by focusing on labour market experience and job tenure as our variables of interest in the earnings functions.

### **3. Methodology and data**

The goal of this paper is to determine the contribution of labour market experience and employer tenure (or seniority) on individual worker wage growth for black and white South African men and women. As a point of departure for the empirical analysis we rely on Mincerian earnings functions for our four groups estimated by pooled OLS. Labour market experience and employer tenure serve as our variables of interest in these earnings equations. Labour market experience is measured in our dataset as 'age minus years of schooling completed (i.e. education) minus six' while employer tenure is measured as the number of years that a worker has worked for the same employer. Other variables we control for in the earnings regression include education, province, rural/urban status, household head, marital status, firm size, union status, and wave fixed effects instead of time fixed effects since we mainly working with short pooled dataset. The remainder of this section introduces the dataset that the empirical analysis that the next section is based on.

The analysis in the next section makes use of the Labour Force Surveys (LFSs) conducted by Statistics South Africa (Stats SA). The LFSs are nationally representative cross-sectional household surveys that are meant to monitor developments in the South African labour market. The surveys were conducted twice yearly – March and September – from September 2000 to September 2007 when they were replaced by the Quarterly Labour Force Surveys. The LFSs were designed as a rotating panel of dwelling units with 20% of these units dropped in subsequent waves and replaced with new dwelling units (Stats SA, 2006). The rotations were designed in such a way that a total sample of 30 000 households was maintained in each wave.

For the empirical analysis we pooled together the individual cross-sectional surveys running from September 2001 to March 2004. We focus on these waves because they correspond to Stats SA’s Labour Force Survey Panel (LFSP) that is also used for the analysis in the next section. The LFSP was constructed after the collection, processing and release of the individual LFS waves (Stats SA, 2006). The LFPS was constructed afterwards because the original LFSs were only initially intended as a rotating panel of dwelling units and not of individuals or households (Stats SA, 2006). The estimation sample was restricted to black and white men and women between the ages of 15 and 64. Workers in subsistence agriculture and those reporting to be self-employed were excluded from the analysis.

Table 1 below provides a summary of the descriptive statistics for some of the key variables in our analysis. From the Table we see that there’s a massive racial gap in real hourly wages but that such gap is smaller across genders. For instance the average hourly wage rate for white men is roughly four times of that for black men. The racial and gender gaps in earnings is a key part of the motivation for this paper. In particular, we are interested in determining how these earnings gaps evolve as workers labour market experience and seniority within their firms.

**Table 1: Descriptive statistics** (Stats SA LFS, 2001B-2004A)

<b>Variables</b>	<b>Black women</b>	<b>Black men</b>	<b>White women</b>	<b>White men</b>
Real hourly wage	8.54 (13.13)	9.77 (13.59)	26.11 (24.96)	38.59 (43.96)
Potential experience	24.09 (12.09)	23.93 (12.37)	19.85 (11.19)	20.93 (11.22)
Education (completed years)	8.57 (4.20)	8.09 (4.09)	12.40 (1.69)	12.30 (1.83)
Age	38.69 (10.11)	38.08 (10.29)	38.32 (11.05)	39.32 (11.08)
Employment tenure	6.60 (7.07)	7.58 (7.81)	7.02 (7.01)	8.58 (8.37)

Notes: Own calculations. Standard deviations in parentheses.

According to our available measure of labour market experience, which is a combination of an individual’s age and completed years of education, black workers have roughly 3 more years of labour market experience compared to their white counterparts. This is a clearly as a result of lower average completed years of education for black workers with less than 9 completed years of education compared to the mean of 12 years for white workers in our sample. There are no significant differences in age. Do more measured years of labour market returns benefit black workers in terms of greater individual wage growth since wages and labour market experience are positively correlated? The analysis below will provide answers to this and other questions.

Black women have the lowest measured average years of employment tenure (at 6.6 years) while white men have the highest average years of employment tenure at 8.58 years. This may suggest greater mobility for black women either within or out of the labour market. The next section will estimate the wage effects of both labour market experience and employment tenure for black and white South African men and women.

## **4. Empirical analysis**

This section will report and discuss the results of the empirical analysis regarding the wage effects of labour market experience and employment tenure on the expected wages of black and white South African men and women. Section 4.1 below presents and discusses the first set of results which pertain to pooled OLS estimation of the log hour hourly wage regression. From these results, three hypotheses are derived and empirically tested in section 4.2. These hypotheses serve as potential explanations for the results presented in section 4.1. Section 4.3 provides a summary of the results.

### **4.1 Pooled OLS results**

In this section we report results from log hourly wage regressions using pooled OLS. Separate regressions were estimated for black and white workers with labour market experience and employment tenure as the variables of interest. These results are contained in Table 2 below. For the sake of brevity, Table 2 only shows point estimates for labour market experience; employment tenure; and schooling specified as spline with knots at 7 years (completed primary), 12 years (completed secondary) and tertiary which is more than 12 years of schooling; and a constant (intercept).

Table 2 and all tables to follow (unless otherwise indicated) organise the results in the following manner: Column 1 presents the results for black women followed by results for black men, white women and then white men in the last column. Consequently, a movement from the first to the last column simulates the stereotypical racial and gender hierarchy in labour market outcomes in South Africa with black women as the least advantaged and white men as the most advantaged of all groups. It will thus be interesting to see if the returns to labour market experience and employer tenure display this pattern.



**Table 2: Log Hourly Wage Regression – Pooled OLS (Stats SA LFS, 2001B-2004A)**

	<b>Black women</b>	<b>Black men</b>	<b>White women</b>	<b>White men</b>
P.Experience	0.0219 (0.0021)***	0.0320 (0.0018)***	0.0326 (0.0045)***	0.0319 (0.0049)***
P.Experience <sup>2</sup>	-0.0002 (0.00004)***	-0.0004 (0.00003)***	-0.0007 (0.0001)***	-0.0006 (0.0001)***
Tenure	0.0439 (0.0023)***	0.0359 (0.0018)***	0.0233 (0.0053)***	0.0238 (0.0045)***
Tenure <sup>2</sup>	-0.0011 (0.0001)***	-0.0007 (0.0001)***	-0.0004 (0.0002)*	-0.0004 (0.0001)**
Primary (spline)	0.0292 (0.0030)***	0.0407 (0.0028)***	0.0892 (0.0640)	0.0625 (0.0405)
Secondary (spline)	0.1616 (0.0037)***	0.1347 (0.0030)***	0.1365 (0.0156)***	0.1433 (0.0122)***
Tertiary (spline)	0.3686 (0.0105)***	0.3896 (0.0093)***	0.1363 (0.0144)***	0.1858 (0.0108)***
Constant	0.1211 (0.0403)***	0.0141 (0.0421)	0.8500 (0.4430)*	1.2798 (0.3027)***
Observations	29166	37333	5369	5937
R-squared	0.61	0.53	0.26	0.34

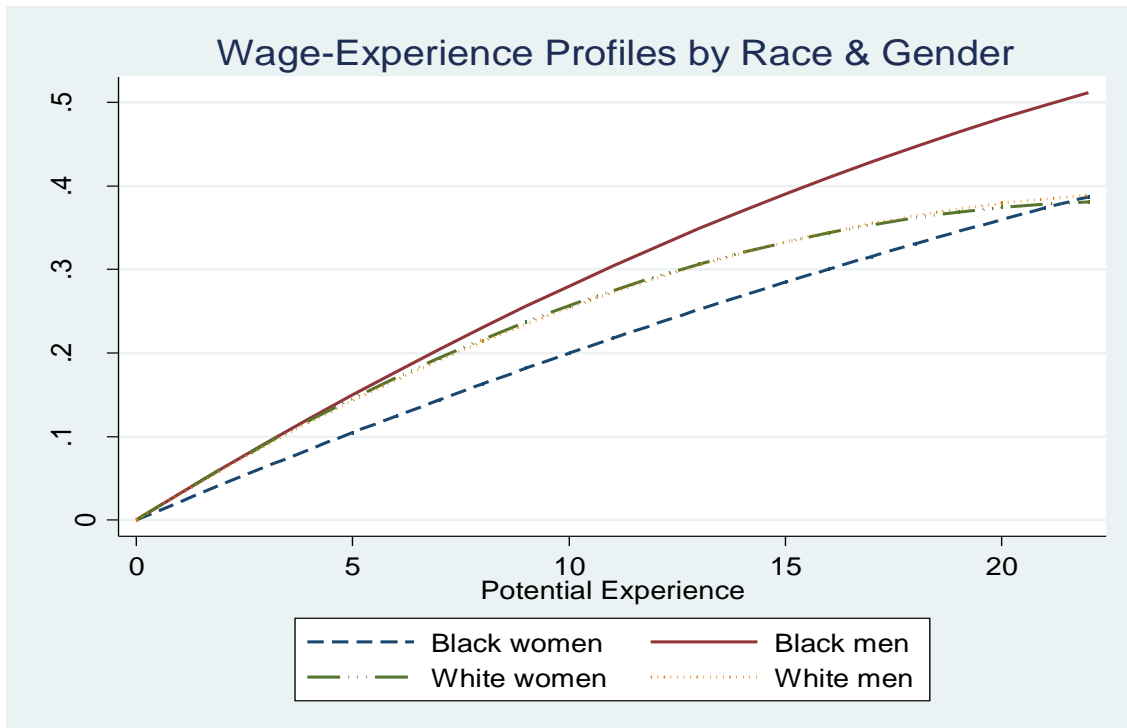
Controls: province; rural/urban status; household head; marital status; firm size; union status; and wave fixed effects  
Robust standard errors in parentheses

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The estimated coefficients for the variables of interest exhibit statistically positive but diminishing wage returns for all four groups. Nonetheless, the results in Table 2 reveal interesting patterns regarding the wage returns to labour market experience and employment tenure with clear divisions along racial lines. For black workers, an additional year of employer tenure is more valuable than an additional year of labour market experience. The opposite is true for white workers with an additional year of labour market experience having a larger wage effect.

While there appears to be a different overall pattern of wage returns for the two race groups, an interesting picture emerges for black women. An additional year of labour market experience brings about a smaller wage effect for black women compared to the other three groups who roughly have similar returns to labour market experience. The point estimate for the linear experience term for black women is 0.0219 compared to 0.0320, 0.0326 and 0.0319 for black men, white women and white men, respectively. The point estimate for the squared experience term for black women, however, suggests that the returns to labour market experience diminish at a much slower rate than for the other groups. Figure 1 below uses the results in Table 2 to trace out a wage-experience profile for all four groups.

**Figure 1:**



From the above figure, we observe that the wage-experience profile for black women lies significantly lower than the profiles of the other groups. Also evident from the figure is a slower diminishing rate of return for black men and women. Average cumulative wage growth for black women due to 5 years of labour market experience is roughly 10% and 20% after 10 years of labour market experience. This is significantly lower average cumulative wage growth as compared to 15% and 25% for white men and women after 5 and 10 years of labour market experience, respectively.

We now turn our attention to the returns to employment tenure and the comparison between the groups delivers a different picture. An additional year with the same employer now benefits black women the most and white women and men the least. Black men lie somewhere in the middle. Figure 2 below which is based on the estimates in Table 2, graphically illustrates the wage-tenure profiles for the four groups. The larger contribution made by the returns to tenure for individual average wage growth for black men and women is clearly evident from this figure. After 10 years with the same employer, cumulative average wage growth for black men and women is roughly 35% and only about 22% for white workers.

**Figure 2:**

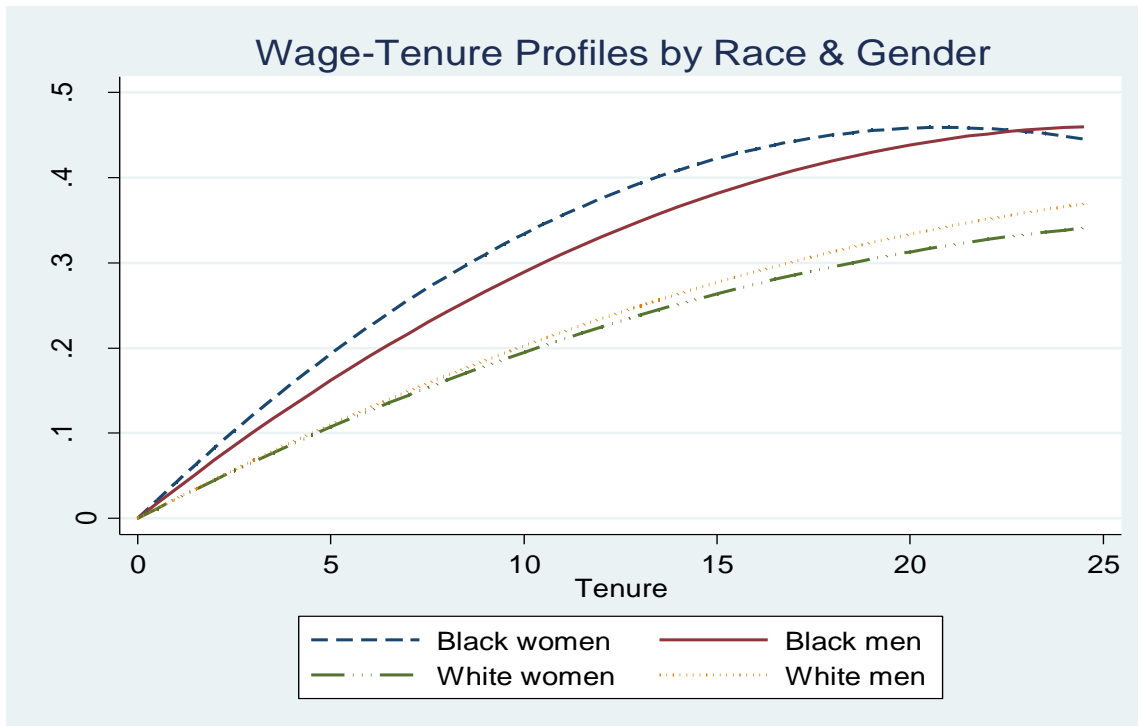


Table 2 reported separate log hourly wage regressions for black and white workers estimated with pooled OLS. From these results we drew the following two related findings about the wage effects of labour market experience and employer tenure. Firstly, an additional year of employer tenure contributes more to average wage growth of black workers and white workers derive much greater wage growth from an additional year of labour market experience. Secondly, black women have the largest estimated returns to employer tenure and the smallest returns to labour market experience. In the next section we investigate these results more closely and derive and empirically test three hypotheses that account for and serve as potential explanations for these results.

#### **4.2 Accounting for the wage-experience and wage-tenure profiles**

The results presented above provide evidence of statistically and economically significant contributions of employment tenure and labour market experience to individual average wage growth for black and white South African workers. However, interesting group differences in the wage effects of labour market experience and employment tenure emerged. In this section we derive, empirically test and advance three hypotheses that account for and serve as explanations for these results. The first hypothesis asks to what extent the flatter wage-experience profile of black women relative to the other groups reflects lower labour market attachment for black women which in turn drives a wedge between ‘actual’ and ‘potential’ labour market experience.

The second hypothesis recognises that there may be important differences in the wage structures faced by workers in different occupations and industries that may influence the wage-tenure and wage-experience profiles faced by these workers. Moreover, there are systematic racial and gender differences in occupation and industry choices among South African workers related to education choices, preferences and other constraints. With this in mind, the second hypothesis asks to what extent the results presented in the previous section merely reflect these differences in wage structures and self-selection between the different occupations and industries.

The last hypothesis uses insights from the job matching models *à la* Jovanovic (1979) and argues that there is greater *ex ante* uncertainty about the expected productivity of black workers and that such uncertainty is specific to the worker-firm match. Such uncertainty is largely driven by noisier labour market signals and weaker labour market attachment that lead to inferior information networks. Our third hypothesis, therefore, postulates that when such uncertainty is resolved through employer learning, there should be quicker within-firm wage growth for these workers which produces steeper wage-tenure profiles for black workers relative to their white counterparts. We expand and investigate the empirical relevance of these hypotheses below beginning with the first hypothesis.

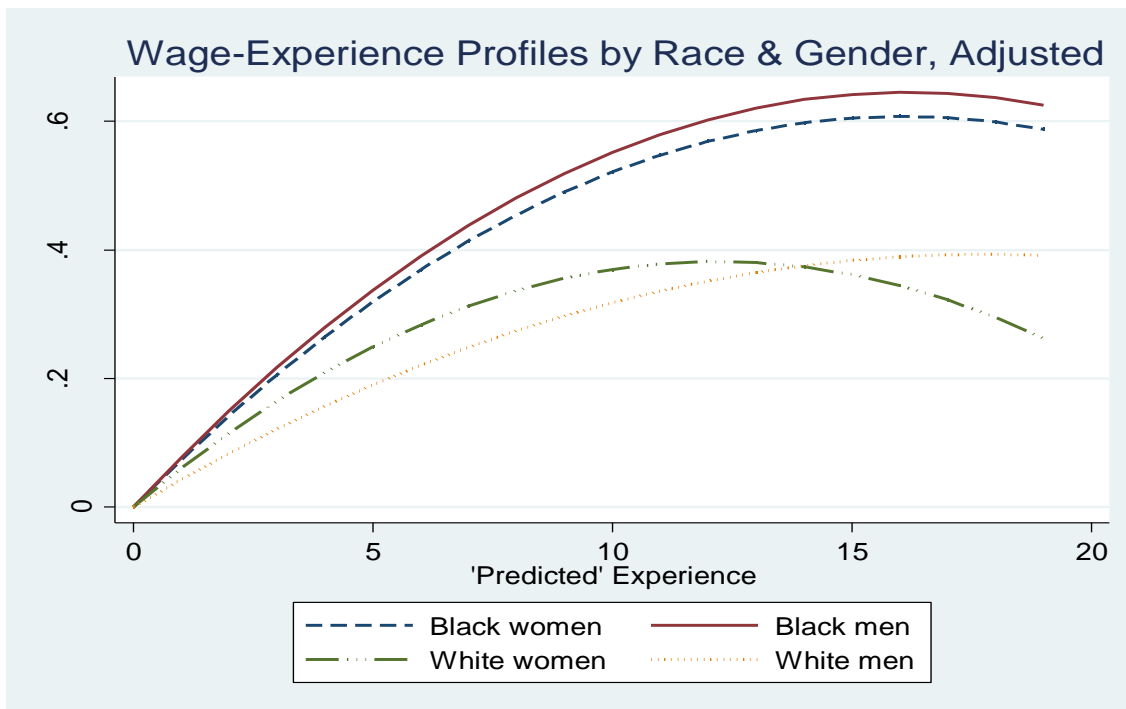
#### **4.2.1 Potential versus Actual labour market experience**

The labour market experience accumulated by a worker is not observed by the econometrician and no direct measure exists in the data sets we have available to analyse the South African labour market. In our analysis we have made use of ‘age minus years of schooling completed (i.e. education) minus six’ as a proxy measure for labour market experience in the absence of a direct measure. This proxy measure is usually dubbed as “potential” experience and was first suggested by Mincer (1974). This is essentially a measure of the time that has elapsed since an individual has left school (Regan and Oaxaca, 2009) and makes many assumptions that are hard to reconcile with workers’ labour market behaviour.

Potential experience assumes a continuous labour force attachment and does not distinguish between employment states – full-time employment versus part-time employment versus narrow or broad unemployment (Regan and Oaxaca, 2009). This is particularly problematic in the South African case since about a quarter of the labour force is unemployed and employment states exhibit strong racial and gender dimensionalities. Black men and women are on average more likely to be classified as narrowly unemployed and more likely to be discouraged than their white counterparts. So we would expect potential experience to systematically overstate actual labour market experience for black workers. In an earnings function, this would lead to a downward bias of the ‘true’ wage effect of labour market experience (Filer, 1993).

So the key issue against potential experience as a measure of labour market experience is centred on the fact that men and women from both races face different employment profiles throughout their life-cycles. To correct for this issue we adjusted the wage-experience profiles above by the group specific employment rates as suggested in Elsby and Shapiro (2011). If we are willing to assume that employment is identically and independently distributed (i.i.d.) across workers at any given point in time, then the product of the employment rate and potential experience would be equal to actual experience for a given worker (Elsby and Shapiro, 2011). But Elsby and Shapiro (2011) point out that employment is in actual fact persistent rather than being an i.i.d. process. Consequently, adjusting potential experience by the employment rate yields an upper bound for the degree of discrepancy between potential and actual experience. Figure 3 below reports the wage-experience profiles for black and white workers adjusted for the discrepancy between potential and actual labour market experience.

**Figure 3:**



After applying the adjustment, the picture is markedly different between Figures 1 and 3. The wage-experience profiles for black women and men now lay above the profiles for white women and men. It appears that the flatter wage-experience profile for black women is driven by their weaker labour market attachment. In other words, black women are penalised for the time they spend outside of the labour market and the unadjusted flatter wage-experience profile in Figure 1 does not account for this penalty.

In this section we investigated the possibility that the flatter wage-experience profile of black women relative to the other groups reflects lower labour market attachment for black women which in turn drives a wedge between ‘actual’ and ‘potential’ labour market experience. Figure 3 provided evidence in favour of this hypothesis. Namely, that accounting for the fact that black women spend relatively more time out of the labour market due to lower employment opportunities and greater household responsibilities, they in fact have a much steeper wage-experience profile. We now turn to the second hypothesis.

#### 4.2.2 Adjusting for occupation and industry

One potential explanation for the results presented in section 4.1 is that there may be systematic differences in the wage structure between occupations and industries that lead to different wage-experience and wage-tenure profiles. This may be of relevance for our analysis because there exists systematic racial and gender differences in the absorption rates between different occupations and industries in the South African labour market. Table 3 below illustrates this point by collapsing the 10 occupation categories into 3 skills categories<sup>3</sup> and then showing the distribution across the 3 skills categories by gender and race. According to Table 3, about 54% of black women in our sample are absorbed into the unskilled category which comprises of domestic services and elementary occupations. White workers are absorbed into the semi-skilled and skilled occupations while black men are predominantly absorbed into the semi-skilled occupations. This strongly reflects the remnants of the racial hierarchy in occupation choices that was engineered by the Apartheid government’s labour market policies designed to limit labour market opportunities of black workers.

**Table 3: Occupation grouping by level of skills, percentages**

	<b>Unskilled</b>	<b>Semi-skilled</b>	<b>Skilled</b>	<b>Total</b>
Black women	54.4	27.8	17.8	100
Black men	26.9	62.2	10.9	100
White women	1.4	55.5	43.1	100
White men	3.4	46.8	49.8	100

Notes: Own calculations from Statistics SA Labour Force Surveys, waves: 2001B-2004A.

We therefore control for occupation and industry in our earnings regressions. In Table 4 we estimate a single earnings regression and add gender and race as additional explanatory variables. Column A essentially reproduces the results obtained in Table 2<sup>4</sup>. We have interacted gender and race with the

<sup>3</sup> **Skilled**: legislators, senior officials and managers, professionals, technical and associate professionals;

**Semi-skilled**: clerks, service workers and shop and market sales workers, skilled agricultural and fishery workers, craft and related trades workers, plant and machine operators and assemblers; and

**Unskilled**: elementary occupation and domestic workers.

<sup>4</sup> In Table 4 we have not interacted education with the experience and tenure variables so the point estimates between Table 2 and column A of Table 4 are marginally different in magnitude.

labour market experience and employment tenure variables. Black women are the reference category. Column A reiterates the findings of an additional year of employment tenure having the largest contribution to the wage growth of black women and an additional year of labour market experience having a smaller but still statistically significant contribution.

In column B we control for 10 occupations and 10 industry dummies as additional explanatory variables, these dummies represent each occupation category and industry code available in our dataset. Controlling for occupation and industry reduces the estimated wage effects of labour market experience and employment tenure for all four groups. The gap in the returns between the four groups has, however, remained relatively unchanged. The smaller estimated wage returns are evidence in favour of our hypothesis of occupation and industry differences in wage structures influencing the wage-experience and wage-tenure profiles. In columns C and D we turn the second part of our second hypothesis.

From Table 3 we learned that black women are primarily absorbed into domestic services and elementary occupations. Similarly, more black women are employed in the public sector. With this in mind, in column C and D we investigate whether the prevalence of black women in domestic services and the public sector is what is driving the results in Table 2 and the first two columns of Table 4.

In Column C we interacted the occupation category for domestic workers individually with the tenure and experience variables since domestic workers are predominantly black women and in domestic services there may be a great value placed on trust between employer and employee and this trust may be strengthened the longer the employment relationship continues. The strengthening of this trust may coincide with an increase in the value of the employment relations for both parties and thus lead to greater returns to employment tenure. This logic is however not supported by the results in column C. Black women working as domestic workers earn much greater returns to labour market experience and much lower returns to employment tenure compared to fellow black workers in other occupations. This is evident from the positive, large and statistically significant point estimates for the interactions variables between domestic and the linear experience and tenure variables.

**Table 4: Controlling for occupation and industry**

	<b>Column A</b>	<b>Column B</b>	<b>Column C</b>	<b>Column D</b>
P.Experience	0.0194 (0.0020)***	0.0126 (0.0019)***	0.0041 (0.0023)*	0.0151 (0.0020)***
P.Experience <sup>2</sup>	-0.0002 (0.00003)***	-0.0001 (0.00003)***	0.00001 (0.00004)	-0.0002 (0.00003)***
Black_male*Exp	0.0120 (0.0025)***	0.0063 (0.0023)***	0.0141 (0.0027)***	0.0062 (0.0023)***
Black_male*Exp <sup>2</sup>	-0.0002 (0.00004)***	-0.0001 (0.00004)***	-0.0002 (0.0001)***	-0.0001 (0.00004)***
White_female*Exp	0.0134 (0.0041)***	0.0126 (0.0039)***	0.0178 (0.0040)***	0.0129 (0.0039)***
White_female*Exp <sup>2</sup>	-0.0004 (0.0001)***	-0.0003 (0.0001)***	-0.0004 (0.0001)***	-0.0003 (0.0001)***
White_male*Exp	0.0278 (0.0050)***	0.0258 (0.0047)***	0.0373 (0.0051)***	0.0248 (0.0048)***
White_male*Exp <sup>2</sup>	-0.0007 (0.0001)***	-0.0006 (0.0001)***	-0.0008 (0.0001)***	-0.0006 (0.0001)***
Tenure	0.0520 (0.0022)***	0.0413 (0.0020)***	0.0469 (0.0025)***	0.0380 (0.0022)***
Tenure <sup>2</sup>	-0.0012 (0.0001)***	-0.0010 (0.0001)***	-0.0011 (0.0001)***	-0.0009 (0.0001)***
Black_male*Tenure	-0.0131 (0.0028)***	-0.0072 (0.0026)***	-0.0126 (0.0029)***	-0.0063 (0.0026)**
Black_male*Tenure <sup>2</sup>	0.0004 (0.0001)***	0.0003 (0.0001)***	0.0004 (0.0001)***	0.0003 (0.0001)***
White_female*Tenure	-0.0431 (0.0062)***	-0.0374 (0.0057)***	-0.0435 (0.0059)***	-0.0371 (0.0056)***
White_female*Tenure <sup>2</sup>	0.0011 (0.0002)***	0.0009 (0.0002)***	0.0011 (0.0002)***	0.0009 (0.0002)***
White_male*Tenure	-0.0401 (0.0052)***	-0.0298 (0.0049)***	-0.0352 (0.0051)***	-0.0289 (0.0050)***
White_male*Tenure <sup>2</sup>	0.0011 (0.0002)***	0.0009 (0.0002)***	0.0009 (0.0002)***	0.0008 (0.0002)***
Domestic_workers*Exp			0.0300 (0.0037)***	
Domestic_workers*Exp <sup>2</sup>			-0.0004 (0.0001)***	
Domestic_workers*Tenure			-0.0145 (0.0043)***	
Domestic_workers*Tenure <sup>2</sup>			0.0003 (0.0002)*	
Public_sector*Exp				-0.0184 (0.0031)***
Public_sector*Exp <sup>2</sup>				0.0003 (0.0001)***
Public_sector*Tenure				0.0085 (0.0033)**
Public_sector*Tenure <sup>2</sup>				-0.0003 (0.0001)***
Observations	77805	77711	77711	77711
R-squared	0.64	0.69	0.69	0.70

Controls: education (splines); race dummies; gender dummies; province; rural/urban status; household head; marital status; firm size; union status; *occupation*; *industry*; *separate dummies for public sector and domestic workers*; and wave fixed effects.

Robust standard errors in parentheses

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%



In column D we follow a similar procedure but with the focus now on the effects of public sector employment on the wage-tenure and wage-experience profiles. Column D paints an interesting picture. There appears to be no wage return to labour market experience after conditioning for the variables we have conditioned for in our earnings regression. Wage growth for public sector employees is solely driven by seniority or returns to employment tenure.

From the evidence presented in Table 4 we can conclude that occupation and industry choice does play a role in accounting for the returns to labour market experience and employment tenure that we estimated in Table 2. Specifically, we have shown that it is not the prevalence of black women in domestic services but rather their prevalence in the public sector that drives their lower returns to labour market experience and greater returns to employment tenure. But occupation and industry choice does not fully account for the full set of results presented in Table 2 since the between-group gap in the wage returns still persists even after controlling for occupation and industry. We therefore proceed to investigate our third hypothesis below.

#### **4.2.3 Uncertainty about the quality of the worker-firm match and expected productivity**

According to Jovanovic's (1979) job matching model of labour turnover, the productivity of a given worker in a given job is unknown *ex ante* by neither employer nor employee and this gives rise to uncertainty about the quality of the worker-firm match. The screening process is imperfect since employers receive noisy labour market signals of the expected productivity of potential workers. The uncertainty is resolved through a learning process in which the worker's output is observed by the employer while on the job. Consequently, workers differ in an unobservable way (or at least unobservable to the econometrician) in the degree to which they (or their skills set) are well matched to their current employer and the quality of the worker-firm match is itself correlated to individual wages but also to tenure.

Building on the insights of Jovanovic, a key prediction of the recent job matching models is that a worker, whose expected productivity is imprecisely estimated, *ex ante*, will enjoy greater within-firm individual wage growth (Sicilian, 1995). In our third hypothesis, we contend that there is greater *ex ante* uncertainty concerning the expected productivity of black workers and quality of the worker-firm matches they enter into. Such uncertainty is largely driven by noisier labour market signals and weaker labour market attachment that lead to inferior information networks. We, therefore, argue that when such uncertainty is resolved through employer learning, there should be quicker within-firm wage growth for these workers which produces steeper wage-tenure profiles for black workers relative to their white counterparts.

We follow two strategies to test for this hypothesis. Firstly, we implement Altonji and Shakotko's (1987) instrumental variables estimator for addressing the heterogeneity the unobserved quality of the worker-firm match that induces endogeneity in the OLS earnings regressions. Secondly, in the context of the Altonji and Shakotko's (1987) IV strategy, we exploit group variation in the average wage gain due to the accumulation of the first year of tenure. The within-firm wage gain in the first year employment is used to infer about the degree of *ex ante* uncertainty around the expected productivity of workers. We expand a bit further on these strategies below and present the results in Tables 5 and 6.

Altonji and Shakotko (1987) suggested instrumenting for the tenure variable (and its higher order term), with “the deviations of the tenure variables around their means for the sample observations on a given job match” as the principal instruments (Altonji and Shakotko, 1987: 439). By construction, “the variation in tenure over the job, in contrast to the variation in tenure across individuals and jobs, is uncorrelated with the fixed individual and job match components of the error term of the wage model” (Altonji and Shakotko, 1987: 438). The instrumental variables strategy of Altonji and Shakotko (1987) allows us to ‘hold’ constant the quality of a given worker-firm match and thus allowing a cleaner estimation of the wage effects of employment tenure. The authors implement this procedure with two-stage least squares (2SLS) estimation and with the use of panel data. We follow this instrumental variables procedure but we however make use of the control function approach for the estimation instead of 2SLS. According to our foregoing hypothesis, after controlling for the unobserved quality of the worker-firm match there should be no significantly greater reward for an additional year of tenure for black workers compared to their white counterparts. Table 5 below summarises the IV results.

**Table 5: Instrumental Variables (Altonji & Shakotko, 1987) – Control Function Approach**

	<b>Black women</b>	<b>Black men</b>	<b>White women</b>	<b>White men</b>
P.Experience	0.0200 (0.0023)***	0.0241 (0.0018)***	0.0365 (0.0046)***	0.0311 (0.0050)***
P.Experience <sup>2</sup>	-0.0001 (0.00003)***	-0.0003 (0.00003)***	-0.0006 (0.0001)***	-0.0006 (0.0001)***
Tenure	0.0193 (0.0037)***	0.0181 (0.0028)***	-0.0062 (0.0077)	0.0143 (0.0077)*
Tenure <sup>2</sup>	-0.0010 (0.0001)***	-0.0006 (0.0001)***	-0.0005 (0.0002)**	-0.0003 (0.0001)**
Constant	1.1438 (0.0904)***	0.7353 (0.0596)***	1.7325 (0.3949)***	1.7946 (0.3056)***
Observations	29147	37280	5363	5921
R-squared	0.67	0.60	0.32	0.41
IV 1 <sup>st</sup> stage F-stats	1082.46	1667.86	247.37	241.72

Controls: education (splines); predicted residuals from 1<sup>st</sup> stage regressions; province; rural/urban status; household head; marital status; firm size; occupation; industry; union status; and wave fixed effects.

Robust standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

There are a number of interesting and key results summarised in Table 5 that contrast with the results presented in Table 2. Firstly, the wage effects of employment tenure for all groups are smaller when estimated using the instrumental variables strategy. This suggests that the pooled OLS results in Table 2 that do not address the unobserved heterogeneity in worker-firm match quality are upwardly biased. This is in line with Altonji and Shakotko's (1987) contention that employment tenure is positively correlated to the worker-firm match quality and thus introduces an upward bias in an OLS estimation of the wage effects of employment tenure.

Controlling for worker-firm match quality reduces the estimated wage effect of tenure by half for black workers – the coefficient for the linear tenure term decreases from 0.0439 to 0.0193 for black women and from 0.0359 to 0.0181 for black men. And the between-group gap in the returns to tenure has drastically been reduced. All groups with the exception of white women appear to enjoy roughly equal wage returns to tenure. The wage-tenure profile for white women is completely flat. The finding of roughly equal wage returns between the groups is in line with the international literature; see for example Bratsberg and Terrell (1998) who document similar findings for black and white men in the United States.

The larger returns to tenure for black workers documented in Table 2 seem to have been largely driven by unobserved heterogeneity in the quality worker-firm match that induce a spurious correlation between tenure and wages.

Another important result from Table 5 is the equalising of the wage returns to labour market experience and employment tenure for black workers. In Table 2, an additional year with the same employer brought about a wage effect that was roughly twice the wage effect that accrued from an additional year of labour market experience for black women. Be that as it may, black workers (particularly black women) have lower wage returns to labour market experience compared to white workers. We now turn to our second piece of evidence that lends further credence to our third hypothesis.

One of the key predictions of the job matching models is that individual within-firm wage growth is quicker for workers who employers are more uncertain about their expected productivity at the time of hiring. Wage growth is quicker because initial wages for these workers converge on their expected productivity as their true productivity is learned by employers (Sicilian, 1995). According to the job matching model, workers whom employers are more certain about their expected productivity (due maybe to better labour market signalling) will receive initial wages that reflect their true productivity and thus removing the mechanism that induces wage growth under this model.

With employer learning occurring early in an employment spell (Lange, 2007), we rely on group variation in the average wage gain due to the accumulation of the first year of tenure as our measure of the *ex ante* uncertainty around the expected productivity of black workers. In our earnings regressions we now add a dummy variable (*'oneyear'*) equal to one if tenure is larger or equal to one, and zero otherwise<sup>5</sup>. This dummy variable ensures that the wage gain due to the accumulation of the first year of tenure is not restricted by the quadratic specification of the tenure variable (Altonji and Shakotko, 1987). The coefficient on *'oneyear'* thus captures the within-firm wage growth due to the accumulation of the first year of tenure while still controlling for the tenure profile. Table 6 below reproduces the results in Table 5 but with *'oneyear'* now as an additional regressor.

**Table 6: Testing for Information Asymmetry/Uncertainty**

	<b>Black women</b>	<b>Black men</b>	<b>White women</b>	<b>White men</b>
P.Experience	0.0209 (0.0023)***	0.0253 (0.0018)***	0.0368 (0.0047)***	0.0323 (0.0050)***
P.Experience <sup>^2</sup>	-0.0001 (0.0000)***	-0.0003 (0.0000)***	-0.0006 (0.0001)***	-0.0006 (0.0001)***
Tenure	0.0098 (0.0042)**	0.0106 (0.0031)***	-0.0093 (0.0087)	0.0072 (0.0085)
Tenure <sup>^2</sup>	-0.0008 (0.0001)***	-0.0005 (0.0001)***	-0.0004 (0.0002)**	-0.0002 (0.0001)
Oneyear	0.0958 (0.0199)***	0.0817 (0.0177)***	0.0376 (0.0511)	0.0783 <sup>6</sup> (0.0487)
Constant	1.0639 (0.0917)***	0.6671 (0.0612)***	1.6907 (0.3957)***	1.7202 (0.3076)***
Observations	29147	37280	5363	5921
R-squared	0.67	0.60	0.32	0.41
IV 1 <sup>st</sup> stage F-stats	724.47	1144.73	163.65	165.72

Controls: education (splines); predicted residuals from 1<sup>st</sup> stage regressions; province; rural/urban status; household head; marital status; firm size; occupation; industry; union status; and wave fixed effects.  
Robust standard errors in parentheses.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The estimated coefficient on the *'oneyear'* dummy variable is statistically and economically significant for black men and women. Holding the tenure profile constant (i.e. the linear and squared tenure terms), individual wages for black women increases by an additional 10% in the first year of employment. The similar figure for black men is 8.5%. We ascribe this additional growth in wages as the effect of uncertainty around the productivity of these workers being resolved as employers learn about their true productivity. Put differently, greater within firm wage growth early in an

<sup>5</sup> *oneyear* is set equal to 0.5 if tenure is equal to 0.5 since our data is collected bi-annually which means that tenure in our data increases in increments of 0.5.

<sup>6</sup> Marginally insignificant (p-value = 0.108) according to the standard statistical significance levels.

employment spell is indicative of greater *ex ante* uncertainty around the expected productivity of black workers.

Moreover, a great deal of the wage effect of tenure that remained in Table 5 after controlling for worker-firm match quality seems to occur in the first year of employment and we argue that it should be ascribed to employer learning and uncertainty being resolved. This process, however, appears not to be exclusive to just black workers since the point estimate for the ‘*oneyear*’ dummy variable for white men is large in magnitude and marginally insignificant. But we cannot with any a great confidence reject the hypothesis that this coefficient is statistically different from zero.

In this section we argued that the greater returns to tenure documented in Table 2 for black workers can be accounted for by greater uncertainty concerning the expected productivity of these workers as well as the heterogeneity in the quality of worker-firm matches. The results in Table 5 and 6 provided evidence in support of this view. In the next section we take stock of the evidence provided in our empirical analysis and outline some of the key findings from our analysis.

### 4.3 Summary of results

The objective of this paper was to analyse the relative contributions to wage growth of labour market experience and firm tenure for black and white South African workers. Table 7 below summarises the estimates obtained from our empirical analysis. Instead of reporting point estimates, Table 7 reports the cumulative individual wage growth due to 5 years of labour market experience and firm tenure.

**Table 7: Cumulative individual wage growth due to 5 years of potential experience and tenure**

	Black women	Black men	White women	White men
<b>Experience</b>				
Base specification	11%	16%	16%	16%
Adjusting potential experience	38%	40%	28%	21%
Controlling of occupation & industry	6%	9%	12%	19%
Controlling for match quality	10%	12%	18%	15%
Controlling for uncertainty	11%	13%	18%	16%
<b>Tenure</b>				
Base specification	21%	18%	11%	12%
Controlling of occupation & industry	20%	17%	2%	6%
Controlling for match quality	7%	8%	-1%	7%
Controlling for uncertainty				
– With uncertainty	13%	13%	-1%	8%
– Without uncertainty	3%	4%	-1%	0%

The base specification found roughly greater returns to 5 years of labour market experience for white men, white women and black men at 16%. Black women's average wages were estimated to only grow by 11% after 5 years of labour market experience. Adjusting for the difference between potential and actual experience changes the picture significantly. Black workers now enjoy much larger wage growth relative to white workers. This suggests that black workers (specifically black women) are hugely disadvantaged by their weaker attachment to the labour market. Controlling for occupation and industry reduces the estimated wage growth from the base specification for all groups except for white men. But the relatively lower wage returns for black workers appears to be robust to the inclusion of occupation and industry in our earnings equations. The relative rankings in the rate of returns to labour market experience are also robust to controlling for unobserved match quality and uncertainty around the expected productivity of black workers.

The base specification found greater wage returns to firm tenure for black workers relative to white workers. Controlling for occupation and industry reduces estimated wage returns for white workers and had no effect on the wage returns for black workers. The greater returns for black workers appear to be driven by unobserved matched quality and uncertainty around the expected productivity of black workers. Controlling for these effects reduces the estimated wage effects of firm tenure for black workers.

## 5. Conclusions

The paper's objective was to determine the relative contributions of labour market experience and firm tenure to wage growth for black and white South African workers. From our base specification, black workers enjoy much larger wage growth from an additional year of firm tenure than they do from an additional year of labour market experience. The opposite was true for white workers. We derived and empirically tested three hypotheses that account for and serve as explanations for these results. Our results provided evidence in favour of greater *ex ante* uncertainty around the expected productivity and quality worker-firm matches as the key mechanism behind the relatively larger wage returns to firm tenure for black workers. These results provide support for a greater focus on interventions to strengthen the labour market signals of black workers in order to facilitate better screening and job matching.

## 6. References

- Abraham, K.G. and Farber, H.S. (1987) Job duration, seniority, and earnings. *American Economic Review*, 77(3): 278-297.
- Allanson, P., Atkins, J.P. and Hinks, T. (2002) No end to the racial wage hierarchy in South Africa? *Review of Development Economics*, 6(3): 442-459.
- Altonji, J.G. and Shakotko, R.A. (1987) Do wages rise with job seniority? *Review of Economic Studies*, 54: 437-459.
- Altonji, J. and Williams, N. (2005). Do wages rise with job seniority? A reassessment. *Industrial and Labor Relations Review*, 58(3): 370-397.
- Becker, G.S. (1962) Investment in human capital: A theoretical analysis. *Journal of Political Economy*, 70(5): 9-49.
- Ben-Porath, Y. (1967) The production of human capital and the life cycle of earnings. *Journal of Political Economy*, 75(4): 352-365.
- Bratsberg, B. and Terrell, D. (1998) Experience, tenure, and wage growth of young black and white men. *The Journal of Human Resources*, 33(3): 658-682.
- Elsby, M.W.L. and Shapiro, M.D. (2011) *Changes in the experience-earnings profile: Robustness*. Online appendix to “Why Does trend growth affect equilibrium employment? A new explanation of an old puzzle,” *American Economic Review* (forthcoming).
- Filer, R.K. (1993) The usefulness of predicted values for prior work experience in analyzing labor market outcomes for women. *The Journal of Human Resources*, 28(3): 519-537.
- Garen, J.E. (1989) Job-match quality as an error component and the wage-tenure profile: A comparison and test of alternative estimators. *Journal of Business & Economic Statistics*, 7(2): 245-252.
- Grun, C. (2004) Direct and indirect gender discrimination in the South African labour market. *International Journal of Manpower*, 25(3): 321-342.
- Harris, M. and Holstrom, B. (1982) A theory of wage dynamics. *Review of Economic Studies*, 49(3): 315-333.
- Jovanovic, B. (1979) Job matching and the theory of turnover. *Journal of Political Economy*, 87(5): 972-990.
- Keswell, M. and Poswell, L. (2004) Returns to education in South Africa: A retrospective sensitivity analysis of the available evidence. *South African Journal of Economics*, 72 (4): 834-860.
- Lange, F. (2007) The speed of employer learning. *Journal of Labor Economics*, 25(1): 1-35.
- Lazear, E.P. (1981) Agency, earnings profiles, productivity, and hours restrictions. *American Economic Review*, 71(4): 606-620.
- Leibbrandt, M., Woolard, I., Finn, A., and Argent, J. (2010) Trends in South African income distribution and poverty since the fall of apartheid. *OECD Social, Employment and Migration Working Papers*, 101.

- Light, A. (1998) Estimating returns to schooling: When does the career begin? *Economics of Education Review*, 17(1): 31–45.
- Light, A. and Ureta, M. (1995) Early-career work experience and gender wage differentials. *Journal of Labor Economics*, 13(1): 121-154.
- Mincer, J. (1974) *Schooling, experience, and earnings*. New York: Columbia University Press.
- Murphy, K.M. and Welch, F. (1990) Empirical age-earnings profiles. *Journal of Labor Economics*, 8(2): 202-229.
- Mwabu, G. and Schultz, T.P. (2000) Wage premiums for education and location of South African workers, by gender and race. *Economic Development and Cultural Change*, 48(2): 307-334.
- Nawakitphaitoon, K. (2014) Occupational human capital and wages: The role of skills transferability across occupations. *Journal of Labor Research*, 35:63-87.
- Neal, D. (1995) Industry specific human capital: Evidence from displaced workers. *Journal of Labor Economics*, 13(4): 653-677.
- Parent, D. (2000) Industry specific capital and the wage profile: evidence from the national longitudinal survey of youth and the panel study of income dynamics. *Journal of Labor Economics*, 18(2): 306–323.
- Regan, T.L. and Oaxaca, R.L. (2009) Work experience as a source of specification error in earnings models: implications for gender wage decompositions. *Journal of Population Economics*, 22: 463-499.
- Rospabe, S. (2002) How did labour market racial discrimination evolve after the end of apartheid? *The South African Journal of Economics*, 70(1): 185-217.
- Salop, J. and Salop, S (1976) Self-selection and turnover in the labor market. *Quarterly Journal of Economics*, 90(4): 619-627.
- Sherer, G. (2000) Intergroup economic inequality in South Africa: The post-Apartheid era. *American Economic Review*, 90(2): 317-321.
- Sicilian, P. (1995) Employer search and Worker-firm match quality. *The Quarterly Review of Economics and Finance*, 35: 515-532.
- Statistics South Africa (2006). *The South African Labour Force Panel Survey methodology document*. National Statistics System Division, Pretoria.
- Sullivan, P. (2010) Empirical evidence on occupation and industry specific human capital. *Journal of Labor Economics*, 17: 567-580.
- Topel, R. (1991) Specific capital, mobility, and wages: Wages rise with job seniority. *Journal of Political Economy*, 99(1): 145-176.
- Van der Berg, S. (2014) Inequality, poverty and prospects for redistribution. *Development Southern Africa*, 31(2): 197-218.
- Williams, N. (1991) Seniority, experience, and wages in the UK. *Labour Economics*, 16: 272–283.



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