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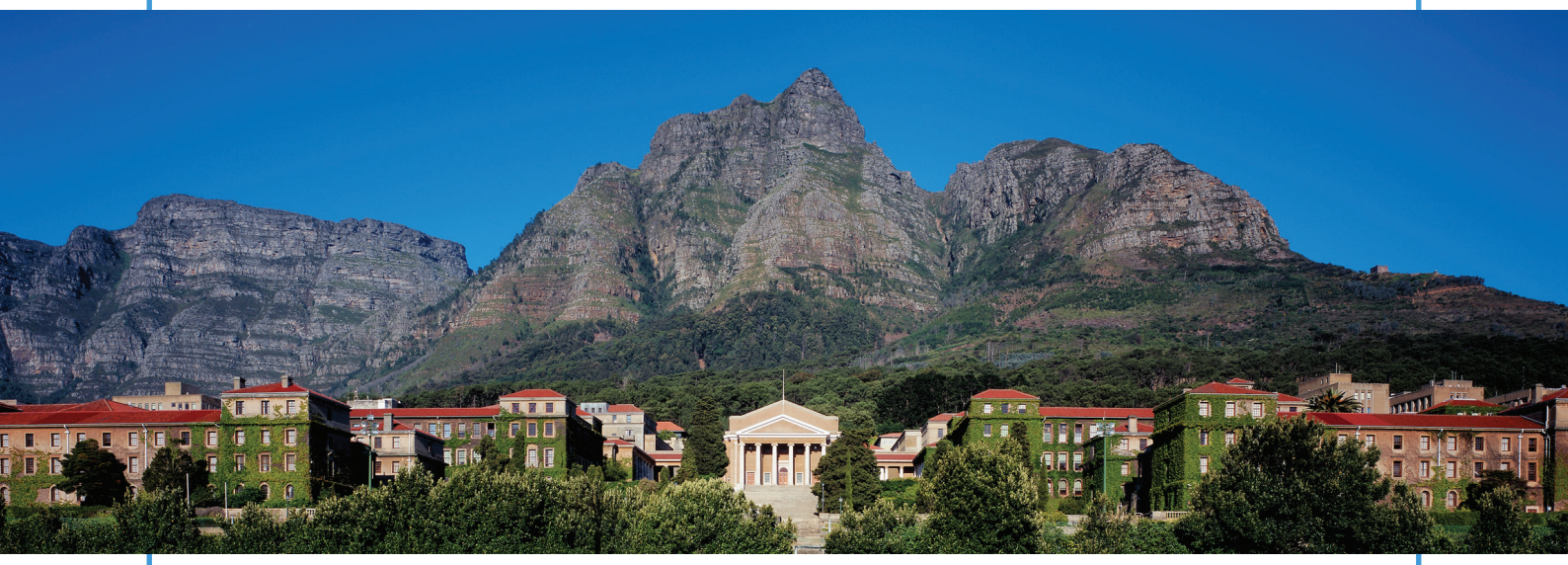

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MIRACLE NTULI

School of Economic and Business Sciences
University of the Witwatersrand
miraclenb@yahoo.com

PRUDENCE KWENDA

School of Economic and Business Sciences
University of the Witwatersrand
prudence.kwenda@wits.ac.za

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ABSTRACT

One Achilles' heel of post-Apartheid South Africa is the growing intra-racial income inequality, particularly among Africans. This paper examines the role of labour unions in explaining this phenomenon among African men given that labour markets are at the core of income inequality in South Africa. Using cross sectional data drawn from labour force surveys for 2001-10, we find a monotonically declining union wage premium. Further, our results indicate that unions have both compressionary and disequalising effects on wages. The disequalising effect dominates the compressionary effect suggesting that unions have a net effect of increasing wage inequality among African men in South Africa. This finding implies that there is scope for unions to reduce inequality through initiatives that promote wage compression.

JEL Classification Codes: D31; J31; J51

Keywords:
Income Inequality; Wage Distribution, Labour Unions, Inequality Decomposition, South Africa

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Corresponding author

Miracle Ntuli, Associate Professor
School of Economic and Business Sciences, University of the Witwatersrand, Johannesburg, 1 Jan Smuts Avenue, P. Bag 3, Wits 2050, Braamfontein, Johannesburg, South Africa
Tel: +27 (0)11 717 8123, email: miraclenb@yahoo.com

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CONTENTS

1. INTRODUCTION

That an unequal dispersion of labour market earnings lies at the heart of an extraordinarily large and increasing problem of income inequality in post-Apartheid South Africa cannot be overemphasised. More recently, this has manifested through growing intra-racial income inequality where the increase is relatively higher for Africans than other races. Hence conclusions abound that increasing intra-African earnings inequality dictates the evolution of aggregate income inequality in the country (Leibbrandt et al., 2012).

Following South African history and international literature, some studies attribute the increase in earnings inequality to the distribution of, and returns to, education among Africans (Mwabu & Schultz, 1996, 2000; Branson et al., 2012). While human capital partly explains the de facto wage distribution, the segmentation of the labour market into union and non-union sectors cannot be ignored, as unions play an important part in wage determination. Following the post-Apartheid Labour Relations Act (1995) which promotes collective bargaining, unionisation increased significantly and fortified unions. Their strength also stems from an inconspicuous line between their efforts and political parties' in resisting the Apartheid regime (Schultz & Mwabu, 1998; Butcher and Rouse, 2001). As such, labour unions in South Africa are labelled as being far too powerful for the country's level of income (Banerjee et al., 2008).

The de-racialisation and strengthening of labour unions in post-Apartheid South Africa motivated research on unions' inter- and intra-racial effects on wages (see for instance, Moll, 1993; Azam & Rospabé, 2007). A common finding from the literature is that union members receive high wage premiums. Based on the presence of a union premium there are perceptions that unions are instrumental to wage inequality in South Africa, yet there is little empirical evidence on this notion (Hofmeyr & Lucas, 2001). International literature shows that the social effect of unions is two-pronged, i.e. unions have a compressionary (within group) effect on their members' wages and a disequalising (between group) effect on wages of union and non-union members via the wage premium (c.f. Card et al., 2004). Thus, focussing on the premium leaves a dearth of knowledge on the net effect of unions on wages.

In light of this, the contributions of this paper are two-fold. First, since unions disequalise wages through the premium, we examine the evolution of the wage premium to assess whether the distortionary effect was growing over time. In addition, this will update available studies which used data for 1985-2004 i.e. Hofmeyr & Lucas (2001) and Banerjee et al. (2008). Results from this will also enable us to verify whether labour unions have successfully preserved the benefits of their members over the 2001-10 decade. This is topical given contemporary worker protests which are linked to loss in confidence towards unions inter alia. Second, the paper will assess the net effect of unions on wage inequality among African men over the same period. If the compressionary (disequalising) effect dominates the disequalising (compressionary) effect it implies that unions in South Africa reduce (increase) wage inequality. The findings could signal whether labour unions are among entities driving income inequality in South Africa. The study will use individual data drawn from South African Labour Force surveys.

The rest of the paper is organized as follows. In section 2 we present a brief background on inequality and labour unions in South Africa. We review relevant literature on inequality and labour unions in section 3. The methodology and data are discussed in section 4. Section 5 discusses the results and section 6 concludes the paper.

2. BACKGROUND ON INEQUALITY AND LABOUR UNIONS AMONG AFRICANS

Income inequality in South Africa has its roots in the system of political Apartheid which was institutionalised in 1948. Apartheid was geared to advance the economic welfare of white people at the expense of Africans, coloureds and Indians (Leibbrandt et al., 2001; van der Berg & Bhorat, 1999). This saw the creation of separate economies for the different racial groups with whites' being more advanced and serviced by other racial groups'. In the process whites had relatively higher access to quality education, superior jobs, wages and working conditions, and income generating opportunities than non-whites – in all these Indians fared better than coloureds who in turn were better than Africans (Leibbrandt et al., 2001; van der Berg & Bhorat, 1999). Furthermore, poor whites had the privilege of state grants while these were rationed for non-whites. This undoubtedly skewed the distribution of wages, income and access to opportunities in the economy.

More importantly, the disadvantaged position of African workers was institutionalised in labour relations, the Bantu Labour Act (1953) and the Industrial Conciliation Act (1956) prohibited Africans to form or join registered labour unions (van der Berg & Bhorat, 1999:7; Bendix, 2001:67). This strategically left white unions with power to set wages for all workers in the various sectors of the economy. This arrangement enabled white workers to ensure that their wages remained higher than others. African workers resisted this oppression which culminated into legislation of their labour unions in 1980 leading to the expansion of union membership (Bendix, 2001:77). Most of the new unions represented the interests of unskilled and semi-skilled workers (mainly non-whites) who were militant in the face of entrenched unfair labour practices (Bendix, 2001:78). Despite having a voice in the industrial relations systems, African workers were still politically oppressed. The oppression led them into forming alliances with political parties in fighting for democracy (Finnemore & van der Merwe, 1996:33; Bendix, 2001:81).

Since the attainment of democracy in 1994, the post-Apartheid government has made major changes to the South African constitution and effected new policies aimed at reducing income inequality. As mentioned earlier, the wage determination process in the new dispensation is underpinned by the Labour Relations Act (1995), which gives workers freedom to join labour unions and provides a platform for collective bargaining. The collective bargaining process occurs at two echelons; centralised and plant levels. Centralised bargaining occurs when one or more registered labour unions bargain with one or more registered employer organisations for wages and working conditions in a particular industry or sector (Bendix, 2001:271; Butcher & Rouse, 2001; Bhorat et al., 2012). This happens when labour unions and employer organisations are representative of the majority of their members, and they have been granted ministerial approval (Bendix, 2001:271; Butcher & Rouse, 2001). The bargaining council agreements can be extended to non-union workers in covered sectors. Non-members can, however, seek ministerial exemption from the conditions (Bhorat et al., 2012).

The second level of collective bargaining occurs at individual plants: unions for workers at a plant can bargain with their employers for plant specific wage adjustments and conditions of employment. This level of bargaining can supplement agreements from bargaining councils - union workers covered by bargaining councils receive the same union premiums as those outside the bargaining council (Butcher & Rouse, 2001). While wages in the union sector are set as discussed above, those in the competitive sector are set by employers presumably on the basis of their profit maximising decisions. In conclusion, the wage setting process for the union sector has been well documented by earlier studies hence here we only presented a summary. See for instance Moll (1993), Butcher & Rouse (2001) and Bhorat et al. (2012) for more details.

3. LITERATURE REVIEW

This section presents a brief review of literature on income inequality in South Africa, as well as extant literature on the impact of labour unions on wages.

There are numerous studies in South Africa which document the extent and evolution of income inequality at household level and in the labour market. According to Hoogeveen & Ozler (2005), the overall Gini of household per capita income increased from 0.57 in 1995 to 0.58 in 2000. Concomitantly, the contribution of between population group inequality to overall inequality decreased from 38-33%. This implies that an increase in intra-racial inequality accounted for the overall increase in inequality between 1995 and 2000. The increase was mostly attributed to a rise in intra-African inequality as the associated Gini increased from 0.47 to 0.50 over the same period. This result is also supported by Leibbrandt et al. (2012) who further distinguished the labour market as the main source of aggregate inequality in South Africa. Labour market income contributed between 85% and 88% to the overall Gini coefficient. This finding concurs well with Leite et al. (2006) and Tregenna &Tsela (2012). These authors also found that there has been a slight decrease in earnings inequality from 2000-2007, when all races are considered. It is noteworthy that although the literature has similar qualitative conclusions on inequality trends, it lacks consensus on the magnitude of inequality due to use of different data sets, different ways of constructing incomes from interval data, and different samples.

Given that labour markets are at the core of earnings inequality in South Africa, concerted efforts have been invested towards understanding the role of labour market institutions, particularly unions, in shaping income inequality. Interest in unions was partly roused by the strengthening of African labour unions post their legislation in 1980, a need to verify whether labour unions also compress the wage distribution as posited by international literature, and a need to understand whether unions lead to wage inflexibility in an era of high unemployment (Card et al., 2004; Moll, 1993; Butcher & Rouse, 2001; Schultz & Mwabu, 1998; Azam & Rospabé, 2007; Banerjee et al., 2008; Hofmeyr & Lucas, 2001).

A general result from these studies is that union members receive a wage premium relative to non-union members. Although, these studies provide irrefutable evidence for the existence of a union wage premium, they do not present a consistent measure of the premium. Some report values as low as 6% (Bhorat et al., 2012), others around 24% (Moll, 1993; Barnajee et al., 2008) and some in excess of 100% (Azam & Rospabé, 2007; Michaud & Vencatachellum, 2001). This large variation in the premium is largely driven by use of different estimation samples, methodologies and data sets.

An additional finding pertains to the evolution of the union wage premium. For instance, Hofmeyr & Lucas (2001) explored the trend controlling for selection into employment and unions. The results showed that the premium increased from 1985 to 1993, although the magnitudes were not robust across models. In a related study, Barnajee et al. (2008) found a premium which increased from 14% in 1995 to 27% in 2000 and then declined to 23% in 2004. The decrease in recent years raises curiosity – was it fortuitous or it marked the beginning of a declining trend in the premium. This raises a question whether the impact of unions on wage inequality has weakened concomitantly.

Other studies provide evidence suggesting that African labour unions compress the wage distribution of their members (Schultz & Mwabu, 1998 and Butcher and Rouse, 2001). Using quantile regression, Schultz & Mwabu (1998) found a union wage premium of 145% at the bottom of the wage distribution and 19% at the top. This huge variation suggests that unions reduce wage inequality among their members. In synopsis, this discussion shows that unions have two relative wage effects. First they reduce wage dispersion in the union sector. Second,

they disequalise wages between union and non-union sectors. While this information is important, it does not allow us to deduce the overall wage effect of unions, yet this is critical for understanding whether unions increase or reduce wage inequality in South Africa.

4. METHODOLOGY AND DATA ANALYSIS

4.1 Methodology

The standard treatment effects model is widely used to estimate the union non-union wage differential. In this model, a union membership dummy is included in the wage function to capture the union premium or penalty. One drawback of this approach is that it assumes that the coefficients of personal characteristics such as education and age are the same across sectors (Lee, 1978; Heitmueller, 2006; Azam & Rospabé, 2007). This assumption implies that the wage setting mechanisms are the same in union and non-union sectors which might not be the case. In light of this inherent limitation of the standard treatment effect model, we estimate the union wage premium using an endogenous switching regression model applied by Lee (1978). This model allows us to estimate separate wage functions for union and non-union members thereby yielding richer results with regards to structural differences in wage determination between the two sectors.

In the endogenous switching regression model, a switching equation sorts individuals over two states (Lokshin & Sajaia, 2004) – in this case union and non-union sectors. The state in which an individual is selected into determines the wage regime faced by that individual. Formally, the model is specified as follows:

$$\ln w_{U\,i} = X_i \beta_U + u_{Ui} \quad (1)$$

$$\ln w_{Ni} = X_i \beta_N + u_{Ni} \quad (2)$$

$$I_i = \delta(\ln w_{Ui} - \ln w_{Ni}) + Z_i \gamma - \varepsilon_i \quad (3)$$

Where:

I_i is a latent variable that determines the sector in which individual i is working. If $I_i > 0$, i is selected into regime U (union sector) otherwise regime N (non-union sector) is the outcome;

w_{ji} the wage of individual i in state $j = U, N$;

X_i a vector of individual and job characteristics that influence wages, that is, age, education, occupation, economic sector and location.

Z_i a vector of observed characteristics that influence the sector into which individual i is selected – in this case it consists of age, education, economic sector, location and a dummy variable indicating whether an individual lives with other union members. An inverse mills ratio to control for selection into labour force participation and subsequent employment is also included following the correction procedure suggested by Bhorat et al. (2001);

δ, γ, β are vectors of parameters to be estimated;

u_{ji}, ε_i disturbance terms ($j = U, N$).

Equation (3) is the switching function which determines the sector in which an individual is employed. Equations (1) and (2) are the wage functions for a specific sector. It is assumed that the error terms have a trivariate normal distribution, with mean vector zero and the following covariance matrix:

$$\Omega = \begin{bmatrix} \sigma_U^2 & \sigma_{UN} & \sigma_{U\varepsilon} \\ \sigma_{N1} & \sigma_N^2 & \sigma_{N\varepsilon} \\ \sigma_{\varepsilon U} & \sigma_{\varepsilon N} & 1 \end{bmatrix}$$

Following standard practice, the variance of the error term of the reduced form switching equation is set to 1 in order to identify the parameters δ and γ (Harthog & Oosterbeek, 1991). Given the assumptions placed on the distribution of the error terms, the logarithmic function for the wage equations and switching function is (c.f. Lee, 1979; Lokshin & Sajaia, 2004):

$$\ln L = \sum_{i=1} \{I_i \omega_i [\ln(F(\eta_{Ui}) + \ln(f(u_{Ui}/\sigma_U)/\sigma_U) + (1-I_i)\omega_i [(\ln(1-F(\eta_{Ni})) + \ln(f((u_{Ni}/\sigma_N)/\sigma_N)]\} \quad (4)$$

Where $\eta_{ji} = [\gamma Z_i - \rho_j \mu_{ji}/\sigma_j] \Big/ \sqrt{1-\rho_j^2}$; F is the cumulative normal distribution and f is a normal density distribution function, ω_i is an optimal weight for observation i and ρ_j the correlation between μ_{ji} and μ_i. Since both w_U and w_N cannot be observed simultaneously for individual i, σ_{UN} does not appear in the likelihood function as this parameter is unidentified.

Conditional on union status, the union wage equation is given by:

$$E(\ln w_{Ui} \mid I_i = 1) = X_i \beta_U + \sigma_{U\varepsilon} \left(\frac{f(\gamma Z_i)}{F(\gamma Z_i)} \right) \quad (5)$$

Conditional on non-union status, the non-union wage equation is given by:

$$E(\ln w_{Ni} \mid I_i = 0) = X_i \beta_N - \sigma_{N\varepsilon} \left(\frac{f(\gamma Z_i)}{1-F(\gamma Z_i)} \right) \quad (6)$$

The estimated wage equations allow comparison of wage differences between union and non-union sectors. To measure the average percentage increment of the wage rate for union-membership we predict wages using the estimates:

$$\hat{y}_{Ui} = \ln w_{Ui} = X_i \hat{\beta}_U \quad (7)$$

$$\hat{y}_{Ni} = \ln w_{Ni} = X_i \hat{\beta}_N \quad (8)$$

Following Lee (1978), the union-membership premium is computed as follows:

$$P = \frac{100}{n}\sum_{i=1}(e^{\hat{y}_{U_i}} - e^{\hat{y}_{N_i}})/e^{\hat{y}_{N_i}} \tag{9}$$

Where n is the sample size.

Using the estimates from the wage functions, we then examine the impact of unions on earnings inequality (see appendix for formulas). First, inequality measures are computed using predicted earnings from equations (5) and (6). Second, while maintaining the predicted earnings for non-union members using equation (6), we replace predicted earnings of union-members by the following counterfactual earnings distribution:

$$E(\ln w_{Ui} \mid I_i = 0) = X_i\beta_N - \sigma_{U\varepsilon}\left(\frac{f(\gamma Z_i)}{1-F(\gamma Z_i)}\right) \tag{10}$$

Equation (10) provides the earnings of union members under a non-union regime. We then re-compute inequality measures and assess the extent to which they differ. This exercise will enable us to assess the extent to which the premium contributes to inequality.

The second approach used in assessing the impact of unions on earnings inequality is adopted from Card et al. (2004). Using a two sector model, let W_i^N be the log wage of individual i when employed in the non-union sector and W_i^U be the log wage of the same individual i when employed in the union sector. Assume that:

$$W_i^N = W^N + e_i^N \tag{11}$$

$$W_i^U = W^U + e_i^U \tag{12}$$

Where e_i^N, e_i^U are random error terms with conditional means of zero. Assuming that in the absence of unionization, current union workers will receive the same average wage as non-union members, then the union non-union wage gap is given by:

$$\Delta_w = W^U - W^N \tag{13}$$

Let $Var(e_i^U) = V^U$ and $Var(e_i^N) = V^N$ denote the variance of potential wage outcomes of workers in the union and non-union sectors respectively; then the variance gap is given by:

$$\Delta_v = V^U - V^N \tag{14}$$

Let α be the unionization rate, then overall variance of log wages is given by (c.f. Freeman, 1980; Card et al., 2004)

$$V = V^N + \alpha\Delta_v + (1-\alpha)\Delta_w^2 \tag{15}$$

The effect of unions on the variance of wages relative to what would prevail if all workers were paid according to the non-union age regime is:

$$V - V^N = \alpha\Delta_v + (1-\alpha)\Delta_w^2 \quad (16)$$

Equation (16) shows that the presence of unions exerts two effects on the dispersion of wages relative to the counterfactual V^N. First, the within sector effect that is associated with the fact that wage dispersion is different in union and non-union sectors is captured by $\alpha\Delta_v$. Second, the between-sector effect reflecting the wage disequalizing effect caused by unions is captured by the term $(1-\alpha)\Delta_w^2$. Although this analysis does not incorporate differences in the rate of unionization across different types of skill groups, this simple framework provides basic insights into the impact of unions on earnings inequality.

4.2 Data

The data used for the study were obtained from Statistics South Africa's September LFSs (Labour Force Surveys) for 2001, 2004, 2007 and the 3rd Quarter of the 2010 QLFS (Quarterly Labour Force Survey). The surveys are nationally representative containing socio-economic information for individuals living in 30 000 households across the country. The LFSs were reweighted to establish comparability with the QLFS on the basis of the 2001 population census. We restrict our sample to African men aged 15-64 years, provided they had information on our key variables defined in Table A.1, in the appendix. The full samples for 2001, 2004, 2007 and 2010 had 50 485, 51 384, 50 352 and 88 998 individuals, respectively. Table 1 presents economic positions of these individuals; that is, strict and broad LFP (labour force participation) rates, employment and union status. The broad labour force includes employed people, active job seekers and discouraged workers, while the strict labour force excludes discouraged workers. In the initial sample, the broad LFP rates range from 59 percent to 68 percent while the strict LFP rates are relatively lower ranging from 51 percent to 54 percent. Among the participants, approximately 55 percent were employed in 2001 and 2004; this increased to 60 percent in 2007 and 2010.

Table 1: Economic Status by period

	2001		2004		2007		2010	
	mean	std. dev	mean	std. dev	mean	std. dev	mean	std. dev
Panel A: labour-force participation status								
Broad labour-force participation	0.667	(0.471)	0.672	(0.470)	0.676	(0.468)	0.587	(0.492)
Strict labour-force participation	0.539	(0.498)	0.511	(0.500)	0.537	(0.499)	0.510	(0.500)
No. observations	50 485		51 384		50 352		82 998	
Panel B: Employment status								
Employed	0.559	(0.497)	0.558	(0.497)	0.604	(0.489)	0.608	(0.488)
Strict unemployment	0.250	(0.433)	0.203	(0.402)	0.191	(0.393)	0.260	(0.439)
Broad unemployment	0.441	(0.497)	0.442	(0.497)	0.396	(0.489)	0.392	(0.488)
No. observations	32 890		32 890		31 643		45 832	
Panel C: Union status								
Union member	0.537	(0.499)	0.417	(0.493)	0.406	(0.491)	0.412	(0.492)
No. of observations	4 511		4 332		5 340		8 822	

The samples in Panels A and B are used for estimating sample selection correction terms (for LFP and subsequent employment) to be included in our union membership functions. To derive the final sample used in wage functions, we restrict the sample of employed workers to full-time employees in the formal non-agricultural sector. The excluded workers fall outside the domain of South African labour unions. This restriction leaves a final sample composed of 4511, 4332, 5340 and 8822 African men in 2001, 2004, 2007 and 2010, respectively. The corresponding union membership rates for these sub-samples are 54 percent, 42 percent, 41 percent and 41 percent. Our statistics suggest there was some de-unionization among African men between 2001 and 2004, but this stabilized in later years.

Based on the final sample depicted in Panel C, Table 2 presents some basic descriptive statistics of individual characteristics by union status and period. We find that log hourly wages increased over the period, and they are on average higher for union than non-union workers. The higher union wages unveiled here are consistent with previous studies in South Africa and other countries. As indicated in Table 2, there are notable differences across union and non-union workers – union members have higher marriage rates and are generally older than non-union workers. In addition, the proportion of individuals with education above matric is higher among union-members relative to non-union members. For instance, in 2001 the proportion of workers with education above matric is 11 percent in non-union compared to 19 percent in union sector-. This pattern is consistent across all years and more evident in 2007 where the proportion of workers with education above matric is 10 percent in non-union sector compared to 25 percent in union sector. In contrast, workers with education levels below matric are somewhat concentrated in the non-union sector.

Table 2: Descriptive statistics for union and non-union sub-samples by period

	2001				2004				2007				2010			
	non-union		union		non-union		union		non-union		union		non-union		union	
Log hourly wage	2.259	(0.655)	2.510	(0.610)	2.445	(0.706)	2.932	(0.670)	2.751	(0.784)	3.229	(0.762)	3.114	(0.720)	3.723	(0.801)
Demographics:																
Age	36.002	(9.935)	39.190	(9.014)	35.190	(9.667)	39.761	(9.799)	34.322	(10.081)	39.280	(9.999)	34.468	(9.622)	39.641	(9.954)
Married	0.595	(0.491)	0.741	(0.438)	0.593	(0.491)	0.729	(0.445)	0.493	(0.500)	0.681	(0.466)	0.472	(0.499)	0.635	(0.482)
Education:																
No Schooling	0.052	(0.222)	0.052	(0.221)	0.038	(0.191)	0.050	(0.218)	0.031	(0.173)	0.030	(0.170)	0.022	(0.146)	0.018	(0.131)
Primary	0.210	(0.407)	0.268	(0.443)	0.193	(0.395)	0.215	(0.411)	0.174	(0.379)	0.164	(0.370)	0.135	(0.342)	0.113	(0.317)
Incomplete secondary	0.354	(0.478)	0.279	(0.449)	0.365	(0.482)	0.299	(0.458)	0.404	(0.491)	0.320	(0.466)	0.415	(0.493)	0.266	(0.442)
Matric	0.271	(0.445)	0.217	(0.412)	0.295	(0.456)	0.251	(0.433)	0.273	(0.446)	0.283	(0.450)	0.329	(0.470)	0.350	(0.477)
Certificate	0.017	(0.130)	0.020	(0.140)	0.018	(0.133)	0.016	(0.127)	0.015	(0.121)	0.022	(0.147)	0.011	(0.103)	0.022	(0.146)
Diploma	0.052	(0.223)	0.117	(0.322)	0.056	(0.230)	0.111	(0.314)	0.067	(0.249)	0.130	(0.336)	0.068	(0.252)	0.166	(0.373)
Degree	0.044	(0.204)	0.047	(0.212)	0.034	(0.182)	0.057	(0.233)	0.036	(0.187)	0.052	(0.222)	0.020	(0.141)	0.066	(0.248)
Employment sector / industry:																
Public sector	0.161	(0.367)	0.392	(0.488)	0.119	(0.323)	0.360	(0.480)	0.090	(0.286)	0.335	(0.472)	0.056	(0.229)	0.386	(0.487)
Mining and quarrying	0.044	(0.205)	0.234	(0.424)	0.029	(0.168)	0.185	(0.388)	0.027	(0.161)	0.148	(0.355)	0.025	(0.156)	0.120	(0.325)
Manufacturing	0.247	(0.431)	0.197	(0.398)	0.202	(0.402)	0.206	(0.405)	0.203	(0.402)	0.202	(0.402)	0.191	(0.393)	0.205	(0.404)
Electricity, gas & water supply	0.018	(0.133)	0.018	(0.132)	0.009	(0.093)	0.020	(0.139)	0.007	(0.084)	0.013	(0.112)	0.005	(0.072)	0.020	(0.140)
Construction	0.108	(0.310)	0.038	(0.192)	0.146	(0.353)	0.035	(0.184)	0.179	(0.383)	0.035	(0.183)	0.176	(0.381)	0.046	(0.209)
Wholesale & retail trade	0.216	(0.412)	0.091	(0.288)	0.230	(0.421)	0.092	(0.289)	0.250	(0.433)	0.133	(0.340)	0.266	(0.442)	0.078	(0.268)
Transport, storage & communication	0.099	(0.299)	0.069	(0.254)	0.077	(0.267)	0.069	(0.254)	0.085	(0.279)	0.062	(0.241)	0.070	(0.256)	0.080	(0.271)
Financial services	0.131	(0.337)	0.060	(0.238)	0.176	(0.381)	0.085	(0.279)	0.148	(0.355)	0.104	(0.305)	0.180	(0.384)	0.105	(0.307)
Community, social & personal services	0.137	(0.344)	0.292	(0.455)	0.130	(0.337)	0.308	(0.462)	0.102	(0.302)	0.304	(0.460)	0.086	(0.281)	0.347	(0.476)
Occupation & location dummies	yes		yes		yes		yes		yes		yes		yes		yes	
No. of observations	1 819		2 692		2 266		2 066		2 887		2 453		4 856		3 966	

Standard deviations in parentheses.

We also find that most individuals are employed in the private sector; 60-67 percent of union workers and 80-94 percent of non-union workers; compared to the public sector. A relatively large proportion of non-union workers were employed in trade industries and financial services, while those in union jobs were concentrated in mining, manufacturing and services industries. For the manufacturing sector, the workers seem to be equally concentrated across union and non-union sectors. Most workers are employed as sales workers, artisans, operators and in elementary occupations regardless of union status. Also about 80 percent of non-union workers were in urban areas whereas the same applies to 68-78 percent of union workers. In general, the majority of workers were employed in Gauteng and KwaZulu Natal provinces.

5. RESULTS

Given that our model estimates a choice model for union membership and wage functions, our discussion of results is structured as follows: first, we discuss the Heckprobit models of employment and labour-force participation, then the correlates of union membership. This is followed by a discussion of wage functions. Thereafter we discuss the link between unions and wage inequality and robustness checks.

5.1 Heckprobit Models of Employment and Labour-force Participation

The findings for the Heckprobit models of labour force participation and employment are presented in panels A and B of Table 3 respectively. They show that there is an inverted U age-labour force participation profile for African men, and similarly for employment. The probabilities of participating, and employment, are also shown to be higher for married men relative to their non-married counterparts. This suggests that family responsibilities which could be financial may drive African men not only to participate, but to be actually employed.. In line with human capital theory, the prospects of participating and finding a job are positively correlated to education relative to no schooling (i.e. having matric education and above for employment). The outcomes for the exclusion restrictions for the labour force participation model i.e. living with a pension-eligible woman (aged above 59 years) or man (aged above 64 years) in a household – proxies for non-labour income – show that having an elderly woman in a household has non-labour income effects on participation, while the presence of an elderly man is statistically insignificant. The finding for African women is in line with Bertrand et al (2003).

Panel B also shows that the prospects that an individual will be employed are positively correlated with living in a household comprised of a large proportion of other adults who are employed. In line with South African literature on social networks and job status, this result suggests that other employed household members act as a proxy for the respondent's social networks on employment opportunities (e.g. Schoer and Leibbrandt, 2006). Nonetheless, this finding should be interpreted with caution, as it is difficult for us to establish the timelines of the employment events for the respondent and other household members, given that we are using cross section data. It is also noteworthy that this variable could be overestimated, as Burns et al. (2010) maintain that it does not fully capture all network related effects. The findings for the athrho are positive and statistically significant, suggesting that the error terms for the labour force participation and employment equations are positively correlated; hence, it is suitable to estimate the employment equation controlling for sample selection bias.

Table 3: Labour force participation and Employment Probit models

	2001			2004			2007			2010		
	coeff.	std. err		coeff.	std. err		coeff.	std. err		coeff.	std. err	
Panel A: Labour-force participation												
Age	0.349	(0.005)	***	0.338	(0.004)	***	0.716	(0.006)	***	0.347	(0.003)	***
Age-squared	-0.004	(0.000)	***	-0.004	(0.000)	***	-0.004	(0.000)	***	-0.004	(0.000)	***
Married	0.496	(0.029)	***	0.385	(0.042)	***	0.412	(0.040)	***	0.526	(0.028)	***
Primary	0.299	(0.049)	***	0.286	(0.045)	***	0.282	(0.039)	***	0.191	(0.040)	***
Incomplete secondary	0.124	(0.047)	***	0.119	(0.047)	**	0.117	(0.034)	***	0.281	(0.042)	***
Matric	0.720	(0.056)	***	0.906	(0.057)	***	0.831	(0.050)	***	0.767	(0.045)	***
Certificate	0.367	(0.110)	***	0.390	(0.091)	***	0.301	(0.098)	***	0.652	(0.105)	***
Diploma	0.609	(0.097)	***	1.139	(0.123)	***	0.888	(0.099)	***	1.114	(0.052)	***
Degree	0.658	(0.128)	***	0.829	(0.212)	***	0.962	(0.224)	***	1.039	(0.090)	***
Presence of elderly men in household (age>64)	-0.033	(0.038)		-0.073	(0.050)		-0.048	(0.040)		-0.080	(0.033)	**
Presence of elderly women in household (age>59)	-0.254	(0.026)	***	-0.250	(0.021)	***	-0.273	(0.024)	***	-0.241	(0.018)	***
Constant	-5.391	(0.101)	***	-5.249	(0.090)	***	-5.341	(0.104)	***	-5.812	(0.052)	***
Panle B: Employment												
Age	0.152	(0.007)	***	0.156	(0.008)	***	0.164	(0.009)	***	0.155	(0.008)	***
Age-squared	-0.002	(0.000)	***	-0.002	(0.000)	***	-0.002	(0.000)	***	-0.002	(0.000)	***
Married	0.911	(0.032)	***	0.937	(0.031)	***	0.936	(0.030)	***	0.864	(0.029)	***
Primary	-0.002	(0.046)		0.038	(0.053)		0.095	(0.047)	**	-0.187	(0.076)	**
Incomplete secondary	0.032	(0.057)		-0.075	(0.054)		0.054	(0.055)		-0.226	(0.079)	***
Matric	0.113	(0.059)	*	0.026	(0.062)		0.152	(0.073)	**	-0.055	(0.098)	
Certificate	0.258	(0.148)	*	0.287	(0.132)	**	0.293	(0.147)	**	0.181	(0.086)	**
Diploma	0.357	(0.102)	***	0.488	(0.127)	***	0.555	(0.082)	***	0.205	(0.108)	*
Degree	0.518	(0.128)	***	0.797	(0.195)	***	0.590	(0.137)	***	0.538	(0.124)	***
Prop. of other adults in a household who are employed	5.165	(0.109)	***	5.366	(0.102)	***	5.199	(0.082)	***	4.932	(0.071)	***
Constant	-4.826	(0.141)	***	-4.993	(0.164)	***	-4.877	(0.151)	***	-4.726	(0.169)	***
athrho	0.472	(0.035)	***	0.468	(0.029)	***	0.451	(0.027)	***	0.367	(0.039)	***

Location dummies are also included in the labour force participation and emploment equations. Reference group: noschooling. Significance level: ***=1%, **=5%, *=10%. Standard errors in parentheses.

5.2 Union Membership Models

Table 4: Marginal Effects for Union Membership Probit models, by period

	2001		2004		2007		2010	
	Reduced form probit	Structural form probit	Reduced form probit	Structural form probit	Reduced form probit	Structural form probit	Reduced form probit	Structural form probit
Age	0.030 ***	0.030 ***	0.017 ***	0.019 ***	0.030 ***	0.026 ***	0.031 ***	0.033 ***
Age-squared	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***
Married	0.015 ***	0.024 ***	-0.038 ***	-0.035 ***	0.053 ***	0.069 ***	-0.024 ***	-0.024 ***
Primary	0.055 ***	0.073 ***	-0.051 ***	-0.037 ***	0.102 ***	0.076 ***	0.088 ***	0.077 ***
Incomplete secondary	0.037 ***	0.057 ***	-0.004 **	0.012 ***	0.174 ***	0.142 ***	0.132 ***	0.126 ***
Matric	0.044 ***	0.054 ***	0.049 ***	0.059 ***	0.221 ***	0.148 ***	0.223 ***	0.221 ***
Certificate	0.161 ***	0.191 ***	0.039 ***	0.022 ***	0.261 ***	0.184 ***	0.320 ***	0.311 ***
Diploma	0.153 ***	0.182 ***	0.098 ***	0.115 ***	0.239 ***	0.220 ***	0.300 ***	0.288 ***
Degree	0.043 ***	0.087 ***	0.051 ***	0.123 ***	0.129 ***	0.216 ***	0.213 ***	0.229 ***
Mining and quarrying	0.266 ***	0.266 ***	0.248 ***	0.236 ***	0.385 ***	0.376 ***	0.364 ***	0.370 ***
Electricity, gas & water supply	-0.139 ***	-0.151 ***	-0.082 ***	-0.070 ***	0.023 ***	0.084 ***	0.119 ***	0.150 ***
Construction	-0.243 ***	-0.261 ***	-0.217 ***	-0.192 ***	-0.244 ***	-0.219 ***	-0.215 ***	-0.209 ***
Wholesale & retail trade	-0.119 ***	-0.126 ***	-0.147 ***	-0.109 ***	-0.092 ***	-0.026 ***	-0.189 ***	-0.182 ***
Transport, storage & communication	-0.085 ***	-0.093 ***	-0.076 ***	-0.088 ***	-0.063 ***	-0.068 ***	-0.018 ***	-0.021 ***
Financial services	-0.081 ***	-0.087 ***	-0.118 ***	-0.083 ***	-0.011 ***	0.015 ***	-0.088 ***	-0.071 ***
Community, social & personal services	-0.043 ***	-0.054 ***	-0.070 ***	-0.076 ***	0.042 ***	0.056 ***	-0.049 ***	-0.058 ***
Large firms (50/more employees)	0.144 ***	0.043 ***	0.157 ***	0.042 ***	0.147 ***	0.037 ***	0.209 ***	0.039 ***
Job tenure	0.041 ***	0.043 ***	0.043 ***	0.042 ***	0.041 ***	0.037 ***	0.038 ***	0.039 ***
Job tenure squared	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***
Selection term	-0.019 ***	-0.019 ***	-0.012 ***	-0.011 ***	-0.014 ***	-0.013 ***	-0.034 ***	-0.034 ***
Other union members	0.248 ***	0.148 ***	0.314 ***	0.150 ***	0.334 ***	0.150 ***	0.179 ***	0.208 ***
Wage differential		0.117 ***		0.153 ***		0.234 ***		0.072 ***

Other variables included in all the models are constant term; urban, provincial and public sector dummies. Reference groups: no schooling, manufacturing, Gauteng province. Results for age-squared are negative but appear as positive due to rounding off.

Significance level: ***=1%, **=5%, *=10%.

Table 4 shows marginal effects for union membership probit models for 2001, 2004, 2007 and 2010 in reduced and structural forms. The results for reduced form models show an inverted U shaped age-union membership profile. This suggests that unions attract middle-aged workers relative to younger and older counterparts. This result also applies to job tenure. Also, residing with other union members is positively correlated with the prospects of joining a union. According to Moll (1993), this could be reflecting household tastes for unionism or firms' recruitment strategies. Apart from the 2004 sample, the findings for education show that having some form of education increases the probability of joining a union relative to those without schooling. The prospects were, in many cases, highest for those with certificates and diplomas and the effects increased over time. These findings suggest that workers of all education levels could be seeking union protection against possible employer exploitation given high unemployment rates in the country.

Working in large firms increases the chances of joining a union relative to small firms because it is easier for unions to organise workers in large firms. The findings for 2004-2010 also show that being in an urban area increases opportunities to join a union relative to a rural area; the converse applies to 2001. Furthermore, working in the mining sector avails higher opportunities to join a union relative to the base category (manufacturing). The reverse is the case for other industries except electricity, where the effect is not robust. This is expected since mining and manufacturing industries are traditionally union hubs. Being in the public sector also increases chances of unionism relative to the private sector. Provincial variations in the probability of unionism were also detected. This could be due to regional idiosyncratic factors that affect attitudes towards unionism (Moll 1993). Sample selection correction terms are statistically significant, implying that unobservable characteristics which influence the employment decision also affect the probability of joining a union once employed. These were computed from the findings of Heckprobit models of employment as union and non-union wages are only observed for employed people who are a non-random sample of the labour force. Therefore, we controlled for selection into employment following Bhorat & Leibbrandt (2001). Findings for the structural models are qualitatively similar to those of the reduced form models. They also show that the union wage differential is positively associated with the chances of joining a union.

5.3 Wage models

Table 5: Wage Equations by Union status

	2001		2004		2007		2010	
	union	non-union	union	non-union	union	non-union	union	non-union
Age	0.015 *	0.019 *	0.015 *	0.025 ***	0.010	-0.008	-0.007	0.008
Age-squared	0.000	0.000	0.000	0.000 **	0.000	0.000	0.000	0.000
Married	0.023	0.096 ***	0.039	0.056 **	0.012	0.084 ***	-0.003	0.002
Primary	-0.023	0.136 **	0.010	0.100 *	0.110	0.003	0.185 **	-0.073
Incomplete secondary	0.116 ***	0.290 ***	0.088 *	0.195 ***	0.223 ***	0.088	0.271 ***	0.067
Matric	0.338 ***	0.420 ***	0.332 ***	0.381 ***	0.535 ***	0.215 ***	0.412 ***	0.226 ***
Certificate	0.376 ***	0.666 ***	0.476 ***	0.789 ***	0.721 ***	0.361 ***	0.386 ***	0.049
Diploma	0.493 ***	0.743 ***	0.749 ***	0.696 ***	0.890 ***	0.695 ***	0.889 ***	0.427 ***
Degree	0.807 ***	0.973 ***	0.854 ***	1.194 ***	1.214 ***	1.347 ***	0.996 ***	1.042 ***
Urban	0.093 ***	-0.007	0.112 ***	0.065 *	0.142 ***	0.141 ***	0.180 ***	0.192 ***
Mining and quarrying	0.266 ***	0.266 ***	0.089 **	0.006	0.068	0.024	0.117 **	0.027
Electricity, gas and water supply	-0.139 ***	-0.151 ***	-0.062	0.008	0.006	0.281 **	-0.273 ***	0.122
Construction	-0.243 ***	-0.261 ***	-0.160 **	0.060	-0.052	0.077 **	-0.129 *	-0.031
Wholesale and retail trade	-0.119 ***	-0.126 ***	-0.319 ***	0.012	-0.311 ***	-0.004	-0.260 ***	-0.063
Transport, storage and communication	-0.085 ***	-0.093 ***	0.044	-0.062	-0.087	-0.115 **	-0.027	-0.124 ***
Financial services	-0.081 ***	-0.087 ***	-0.282 ***	0.058	-0.215 ***	-0.062	-0.413 ***	-0.044
Community, social and personal services	-0.043 ***	-0.054 ***	0.002	-0.006	0.014	0.056	0.024	-0.099 *
Large firms (50/more employees)	0.012	0.056 *	0.077 ***	0.034	0.073 ***	0.086 ***	0.010	-0.029
Job tenure	0.022 ***	0.014 **	0.012 **	0.002	0.023 ***	0.007	0.020 ***	0.015 **
Job tenure squared	0.000 *	0.000 *	0.000	0.000	0.000 **	0.000	0.000 ***	-0.001 ***
Selection term	-0.398 ***	-0.189 **	-0.128 **	-0.387 ***	-0.094 *	-0.330 ***	-0.103	-0.218 **
Chow test (F-statistic)			(7.240)		6.170		(6.820)	
P-value			(0.000)		(0.000)		(0.000)	

Other variables included in all the models are constant term; urban, provincial, public sector and occupation dummies. Reference groups: no schooling, manufacturing, Gauteng province and machine & plant operators. Significance level: ***=1%, **=5%, *=10%

Some of the findings for age and tenure exhibit an inverted U age/tenure-earnings profile in both the union and non-union sectors. This suggests that regardless of union status, middle-aged workers receive more wage benefits than other workers. The results for education demonstrate that earnings increase with education levels in both sectors. While this outcome accords well with the theory of human capital, it could also be reflecting the skills-biasedness of the South African labour market. While unionised workers have relatively higher wages in 2001 and 2004, the opposite applies in 2007 and 2010 except for workers with a degree. Overall, union wages are higher (than non-union wages) in urban areas than in rural areas, and this urban wage effect has increased over time. The sample selection terms were also negative and statistically significant, which implies that the samples of union and non-union workers were selected, which justifies our correction for sector choice.

Using Equation 9 we computed union wage premia for 2001-2010 and the findings are presented in Table 6. The union premium exhibits a declining trend over the period 2001-2010. In 2001, union workers earned 57 percent more than non-union workers. The premium decreased to 54 percent, 48 percent and 42 percent in 2004, 2007 and 2010 respectively. Differences in these premia are statistically significant at the 5 percent level. This shows that the wage gain of union workers decreased by 15 percent points over the period 2001-2010. This trend harmonizes with that for Banerjee et al. (2008) for the period 2000-2004. It suggests a weakening in the ability of unions to preserve the benefits of their members.

Table 6: Union Wage Premium

Year	Union premium	Std. error	Difference	95% confidence interval
2001	0.567	(0.003)	—	[0.572 ; 0.562]
2004	0.541	(0.004)	0.025	[0.549 ; 0.534]
2007	0.476	(0.004)	0.066	[0.483 ; 0.469]
2010	0.424	(0.002)	0.052	[0.428 ; 0.420]

5.4 Unions and Wage inequality

We further examine the impact of unions on wage inequality using two procedures. The first procedure uses predicted wages for union and non-union workers, computed using Equations 5 and 6, to compute measures of inequality. These results are presented in Table 7, Panel A, labelled “with premium”. We then re-compute inequality measures using a counterfactual distribution for union members (computed using Equation 10) – wages that workers would receive under the non-union wage regime, maintaining predicted wages for non-union members. The inequality measures derived from this distribution are labelled “without premium” in Table 7, Panel A. The second procedure is based on Card et al.’s (2004) model discussed earlier, and the variance decomposition (based on Equation 16) results are presented in Table 7, Panel B.

Table 7: Impact of Unions on Wage Inequality

	2001	2004	2007	2010
Panel A: Inequality measures				
With premium				
Gini	0.297	0.349	0.367	0.370
Theil index	0.147	0.210	0.243	0.249
Atkinson (e = 0.5)	0.069	0.096	0.108	0.110
Atkinson(e = 1)	0.129	0.175	0.191	0.196
Atkinson(e = 2)	0.225	0.289	0.304	0.311
Without premium				
Gini	0.267	0.286	0.323	0.320
Theil index	0.137	0.163	0.237	0.215
Atkinson (e = 0.5)	0.061	0.071	0.098	0.091
Atkinson(e = 1)	0.110	0.126	0.163	0.156
Atkinson(e = 2)	0.179	0.200	0.240	0.240
Panel B: Effect of unions on wage structure				
Mean predicted log wages				
union workers	2.725	2.833	3.099	3.639
non-union workers	2.159	2.299	2.622	3.208
union gap	0.566	0.534	0.477	0.431
Variance decomposition				
Overall variance	0.296	0.379	0.410	0.516
Variance in non-union sector	0.226	0.306	0.355	0.477
Within sector effect	-0.014	-0.013	-0.017	-0.019
Between sector effect	0.084	0.086	0.072	0.058
Total effect	0.070	0.073	0.056	0.039

In accordance with the evolution of South African income inequality, the Gini coefficient with union wage effects increased over the period 2001-2010. In 2001, the Gini was 0.3 and increased by five points in 2004. Though small, a further increase in inequality is registered in 2007 and 2010. When considering the distribution "without premium" – where all workers are paid under the non-union wage regime – we find that the Gini slightly decreased for all years. In 2001, the Gini decreases from 0.3 (with premium) to 0.27 (without premium), while in 2004 it decreases from 0.35 to 0.29. This change in the Gini suggests that unions have a modest effect on wage inequality. This finding is consistent across the years, and is supported by the Theil index and Atkinson's measures of inequality.

It is noteworthy that the magnitude of the Gini reported here is much smaller than in previous studies which report Gini coefficients in excess of 0.5 (see Tregenna & Tsela (2012), for instance). This difference stems largely from the sample used in this study which is restricted to African men employed in formal sector non-agriculture occupations, while other studies included all workers irrespective of gender and race. This restriction is, however, relaxed in the robustness check which is based on an all-inclusive sample.

The above findings on inequality trends are corroborated by the overall variance of earnings. We find that the variance increased from 0.3 in 2001 to 0.52 in 2010. With regards to the decomposition of variance, the negative sign of the within-sector effect indicates that unions have a compressionary effect on wages within the union sector. This result is consistent throughout the 2001-2010 period. The between-sector effect is positive, suggesting that unions also have a disequalising effect on wages between union and non-union sectors. This disequalising outcome is consistent with the common finding of a union wage premium.

Overall, unions in South Africa seem to increase wage dispersion since the between-sector effect outweighs the within-sector effect over the period. Relative to the overall variance, the compressionary effect ranges from 4-5 percent, while the between-sector effect ranges from 12-29 percent. From this result it is clear that unions have a weak compressionary effect relative to the disequalising effect.

5.5 Robustness checks

To ascertain that the results presented in this paper are robust this section presents a series of robustness checks. The first check is concerned with the sensitivity of the results to the selected sample, while the second set of checks examines the sensitivity of the results to compositional changes of union and non-union sectors over time.

Selected sample:
The results discussed earlier are based on a sample which excludes individuals working in the informal sector. To check if the results are not sensitive to this, we re-estimate the model on a 'broader' sample which includes both informal and formal sector workers. The results from this exercise are presented in Table 8, along with the baseline results. The findings indicate that when using a 'broader' sample, we find a larger union wage premium relative the baseline result (which excludes informal sector workers). This result is expected given that informal sector workers often engage in precarious activities which offer relatively low wages (see Perry, 2006). Consistent with the baseline results, we also find a declining union wage premium from 86 percent in 2001 to 50 percent in 2010. With regards to variance decomposition, the results suggest that the net effect of unions is to increase wage dispersion, since the disequalizing effect dominates the compressionary effect. The qualitative similarity of the results is reassuring, suggesting that our findings are not too sensitive to the selected sample.

Table 8: Robustness checks

	Baseline: excl informal sector workers				Incl. informal sector workers				Workers with age > 25 yrs				Workers with educ. <= matric			
	2001	2004	2007	2010	2001	2004	2007	2010	2001	2004	2007	2010	2001	2004	2007	2010
Mean predicted log wages																
union workers	2.725	2.833	3.099	3.639	2.442	2.740	2.968	3.551	2.719	2.826	3.185	3.607	2.590	2.634	2.903	3.373
non-union workers	2.159	2.299	2.622	3.208	1.580	2.050	2.434	3.055	2.127	2.247	2.640	3.108	2.009	2.079	2.419	2.971
union gap	0.566	0.534	0.477	0.431	0.863	0.690	0.534	0.496	0.592	0.579	0.544	0.499	0.581	0.556	0.483	0.402
Variance decomposition																
Overall variance	0.296	0.379	0.410	0.516	0.646	0.520	0.531	0.553	0.320	0.426	0.421	0.503	0.298	0.309	0.336	0.470
Variance in non-union sector	0.226	0.306	0.355	0.477	0.475	0.423	0.474	0.504	0.239	0.337	0.358	0.454	0.219	0.241	0.283	0.436
Within sector effect	-0.014	-0.013	-0.017	-0.019	-0.040	-0.025	-0.016	-0.020	-0.010	-0.016	-0.027	-0.027	-0.010	-0.015	-0.008	-0.018
Between sector effect	0.084	0.086	0.072	0.058	0.211	0.123	0.077	0.069	0.091	0.105	0.090	0.076	0.089	0.083	0.061	0.053
Total effect	0.070	0.073	0.056	0.039	0.171	0.097	0.060	0.049	0.081	0.089	0.063	0.049	0.079	0.068	0.054	0.035

Excl. and incl are abbreviations for excluding and including respectively.

Sector composition:
One potential pitfall of the inter-temporal analysis in this study is that it might be simply reflecting changes in the composition of union and non-union workers. Indeed, there are a number of trends during the 2001-2010 periods that are likely to affect the composition of workers in union and non-union sectors. For instance, the financial crisis might have affected the employment probabilities of low skilled workers which might influence the results. In addition, the implementation of the employment equity policy in this decade is likely to have influenced the wages of skilled African men, as employers competed to employ skilled African men. Given that skilled workers are less likely to join unions, the returns in the non-union sector might affect the estimated average union wage premium. To address these potential pitfalls; first, we re-estimate the model on a sub-sample which excludes young workers (aged 15-25 years). The exclusion of young workers enables us to obtain results based on a sample purged of workers who were likely to become unemployed during the financial crisis. Second, we re-estimate the model on a sub-sample composed of low-skilled workers (i.e. individuals with an education level which is less than or equal to matric), to examine the sensitivity of the results to the implementation of the employment equity policy. The results presented in Table 8 indicate that when excluding workers aged 15-25 years, and low skilled workers, we find a union wage premium which is above the baseline result. The higher premium is in line with the notion that unions avail higher premiums at the bottom of the wage distribution (Schultz & Mwabu, 1998; Casale & Posel, 2012). We also find a declining union wage premium despite the possibility of sector compositional changes. This suggests that our results are fairly robust. Similar to the baseline results, we also find that the disequalizing effect dominates the compression effect, indicating that the net effect of unions is to increase wage inequality for both sub-samples.

6. DISCUSSION AND CONCLUSION

Understanding sources of intra-African wage inequality in South Africa is important for initiatives working to reduce rising income inequality in the country. While there are various drivers of wage inequality such as human capital, historical factors and labour market institutions, this paper focuses on the latter by considering labour unions.

The paper has two interesting findings. First, we find that the union wage premium among full time, wage employed African men has been decreasing over the 2001-2010 decade. This finding is contrary to the results for the 1990s which show an upward trend for African men (Hofmeyr & Lucas, 2001). Although the latter studied a different sample (i.e. African, urban men) from the one herein, it still provides insights on the evolution of the union wage premium. The initial increase in the wage premium as uncovered in Hofmeyr & Lucas (2001) was expected given that South Africa was emerging from a highly discriminatory system characterized by low wages for Africans. Consequently, Africans' unions made concerted efforts to secure sizeable premiums for their members. In recent years, the declining trend uncovered here suggests that unions have been weakening. Possible reasons for this could be the skills-biasedness (towards highly skilled workers) of the labour market, which is juxtaposed to high unemployment. In this context, it might be difficult for unions to bargain for higher premiums as most of their members are lowly educated and vulnerable to unemployment.

Second, we find that unions in South Africa have both compressionary and disequalising effects on wages among full time, wage employed African men. The compressionary effect is however, dominated by the disequalising effect for this particular sample, suggesting that the net effect of unions is to increase wage inequality. On the basis of the above findings, it is clear that unions partly contribute to wage inequality among African men.

When placed in a global context, our findings differ from what has been found elsewhere. For instance in the United Kingdom, United States and Canada, Card et al. (2004) found that

unions reduced overall wage inequality since the compressionary effect outweighed the disequalising effect. This could be due to the differences in human capital, historical factors, labour market institutions and sample of analysis. To some extent this implies that South African unions can contribute to the overarching goal of inequality reduction through more compression of the wage distribution.

We conclude with a discussion of the limitations of this study. First, the Card et al.'s (2004) model used the assumption that non-union members do not benefit from provisions of bargaining council agreements. In South Africa, some non-union workers benefit from bargaining council wage agreements; therefore it is important to verify the extent of the overlap. Unfortunately, this is impossible to check using our data. Nonetheless, Bhorat et al. (2012) analysed the bargaining council wage premia and found that non-union workers covered by bargaining councils receive wage premiums of 9-10 percent. This premium is small in the South African context where premiums can be in excess of 100 percent, suggesting that the spill over effect can be deemed as trivial. Also, Butcher & Rouse (2001) reported that only 16 percent of non-union workers were covered by bargaining councils, which further indicates that the spill over effect is not substantial. The second limitation of this study is that it does not account for unobservable characteristics which might affect sector choice and wages. Future studies can address this using panel data. Third, although we have corrected for sample selection bias in our endogenous switching regression model, our results could potentially be biased. Casale & Posel, (2012) point out that union wage equations are sensitive when controlling for selection through different techniques, and there is no consensus on a superior technique.

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APPENDIX

A. Inequality measures

This appendix presents details of the inequality measures used in Section 5 of the study.

Gini Coefficient (G)
Gini coefficient is the most commonly used measure of inequality. It can be computed as follows (c.f. Gini 1912):

$$G = \frac{1}{2n^2\bar{y}}\sum_{i=1}^{n}\sum_{j=1}^{n}|\, y_i - y_j \,|$$

Where y_i is the income of individual *i*, y is mean income and n is the sample size. When G = 1 it represents perfect inequality, while G = 0 represents zero inequality.

General Entropy (GE) measure
The general Entropy measure is another class of inequality measures defined as:

$$GE(\alpha) = \frac{1}{\alpha^2 - \alpha}\left[\frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i}{\bar{y}}\right)^{\alpha} - 1\right]$$

Measures of the GE are sensitive to changes at the lower end of the distribution for α close to zero and sensitive to changes across the distribution for $\alpha = 1$. It is sensitive to changes at the upper end of the distribution for higher values of α. When $\alpha = 1$, this yields the Theil (1967) index. The values of GE ranges from 0 to ∞, with 0 representing an equal distribution, and higher values representing higher levels of inequality (Litchfield, 1999).

Atkinson measures of inequality (Aε)
This measure has a weighting parameter ε which measures aversion to inequality. The higher the value of ε the more society is concerned about inequality (Atkinson, 1970). The Atkinson class of measures can be computed as follows:

$$A_{\varepsilon} = 1 - \left[\frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i}{\bar{y}}\right)^{1-\varepsilon}\right]^{\frac{1}{(1-\varepsilon)}}$$

Where y denotes mean income. Similar to the Gini coefficient, the Atkinson class of measures range from 0 to 1, with zero representing no inequality and 1 representing complete inequality.

B. Definition of variables used in the study

Table A1: Variable definitions

Variable	Description
Union (dependent variable)	Dummy variable: 1 if individual is a union member, 0 otherwise
Wage (dependent variable)	An individual's log hourly wage deflated to 2001 values
Age	An individual's age in completed years
Married	Dummy variable: 1 if individual is married civilly or traditionally, 0 otherwise
Education	
No education*	Dummy variable: 1 if individual has 0 years of schooling or grade R, 0 otherwise
Primary	Dummy variable: 1 if individual's schooling is in the range grade 1 to 7, 0 otherwise
Incomplete Secondary	Dummy variable: 1 if individual's schooling is in the range grade 8 to 11, 0 otherwise
secondary	Dummy variable: 1 if individual's schooling is grade 12, 0 otherwise
Certificate	Dummy variable: 1 if individual's schooling is vocational or technical training, 0 otherwise
Diploma	Dummy variable: 1 if individual's schooling is diploma, 0 otherwise
Degree	Dummy variable: 1 if individual's schooling is bachelor's degree and above, 0 otherwise
Provinces	
Gauteng*	Dummy variable: 1 if individual resides in Gauteng province, 0 otherwise
Eastern Cape	Dummy variable: 1 if individual resides in Eastern Cape province, 0 otherwise
Free State	Dummy variable: 1 if individual resides in Free State province, 0 otherwise
KwaZulu Natal	Dummy variable: 1 if individual resides in KwaZulu Natal province, 0 otherwise
Mpumalanga	Dummy variable: 1 if individual resides in Mpumalanga province, 0 otherwise
North West	Dummy variable: 1 if individual resides in North West province, 0 otherwise
Northern Cape	Dummy variable: 1 if individual resides in Northern Cape province, 0 otherwise
Northern Province	Dummy variable: 1 if individual resides in Northern province, 0 otherwise
Western Cape	Dummy variable: 1 if individual resides in Western Cape province, 0 otherwise
Urban	Dummy variable: 1 if individual resides in an urban area, 0 otherwise
Industries	
Mining	Dummy variable: 1 if an individual works in mining sector, 0 otherwise
Manufacturing*	Dummy variable: 1 if an individual works in manufacturing sector , 0 otherwise
Electricity	Dummy variable: 1 if an individual works in electricity sector, 0 otherwise
Construction	Dummy variable: 1 if an individual works in construction sector, 0 otherwise
Trade	Dummy variable: 1 if an individual works in trade sector, 0 otherwise
Transport	Dummy variable: 1 if an individual works in transport sector, 0 otherwise
Finance	Dummy variable: 1 if an individual works in finance sector, 0 otherwise
Services	Dummy variable: 1 if an individual works in services sector, 0 otherwise
Firm-size	Dummy variable for firms with more than 50 employees
Job tenure	number of years that an individual has spent with his/her main employer
Public sector	Dummy variable: 1 if an individual is employed in the public sector, 0 otherwise
Occupations	
Manager	Dummy variable: 1 if an individual is a manager, 0 otherwise
Professional	Dummy variable: 1 if an individual is a professional, 0 otherwise
Technician	Dummy variable: 1 if an individual is a technician, 0 otherwise
Clerk	Dummy variable: 1 if an individual is a clerk, 0 otherwise
Service	Dummy variable: 1 if an individual is a services worker, 0 otherwise
Skilled Agriculture/Fishery	Dummy variable: 1 if an individual is a skilled worker, 0 otherwise
Artisan	Dummy variable: 1 if an individual is a craftsman, 0 otherwise
Operator*	Dummy variable: 1 if an individual is an operator, 0 otherwise
Elementary	Dummy variable: 1 if an individual does elementary jobs, 0 otherwise
LFP broad	Dummy variable: 1 if employed, active job seeker or discouraged worker
Employed	Dummy variable: 1 if employed full time in formal non-agriculture sector
*Children<15 years*φ	Dummy variable for the presence of children aged below 15 years in the household
Other hhld union members¥	Dummy variable for co-residence with other union members
*Old men*φ	Dummy variable for co-residence with men aged 65 and above
*Old women*φ	Dummy variable for co-residence with women aged 60 and above
Prop_earn±	Proportion of earners in the household
Prop of other adults	Proportion of other working age people in a respondent's household who are employed

Notes: 1. *Represents base category.
2. φ and ± denote exclusion restrictions in the broad labour force participation and employment models respectively.
3. ¥ denotes exclusion restriction in the union membership probits.

The log hourly earnings in the table were constructed from earnings information which was reported in either points or intervals. Both categories were reflected in weekly, monthly or annual payment intervals. We obtained monthly earnings from point data through multiplying gross weekly wages by 4.3, dividing yearly wages by 12 and retained the gross monthly earnings. To those who reported intervals, we assigned midpoints of the bands as converted to monthly terms. This gave us a series of monthly earnings for 2001, 2004, 2007 and 2010.

These were deflated to 2001 values using deflators from Statistics South Africa. In turn the real monthly earnings were converted to hourly wages as we divided them by hours usually worked per month (i.e. hours usually worked per week in main job multiplied by 4.3).

Development Policy Research Unit
University of Cape Town
Private Bag
Rondebosch 7701
Cape Town
South Africa

Tel: +27 21 650 5705
Fax: +27 21 650 5711

www.dpru.uct.ac.za