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Abstract

Compulsory schooling laws are designed to keep children in school, under the expectation that doing so increases employment opportunities and wages. However, in South Africa, the education system does not perform as well as it does in other countries, which may, in turn, mitigate the effectiveness of the compulsory schooling reform on labour market outcomes. Gender wage gap research in the country finds significant differences that need further explanation. This research investigates whether the 1997 compulsory schooling law (CSL) partially explains gender differences in the distribution of wages, and whether selection into employment moderates that relationship. The analysis is underpinned by conditional quantile regression, along with a selection-corrected version that incorporates the CSL. The data is taken from the 2018 South African General Household Survey. The results suggest that: returns are higher for women than men, the schooling reform increased returns, and are not constant across either the wage distribution or the level of schooling, suggesting that education increases wage inequality. Furthermore, we find also that correcting for selection into employment reduces the returns for women, but does not alter the ranking of returns along the wage distribution before and after the CSL implementation.

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1 Introduction

Compulsory schooling laws (CSLs) are a popular policy instrument designed to increase educational attainment, especially among marginalised populations (de New et al., 2021). The policy compels pupils to stay in school, on the assumption that it is generally beneficial for them in terms of labour market outcomes, such as earnings (Harmon, 2017). The South African government introduced a compulsory schooling law (CSL) in 1997. It requires all young people to attend school from the beginning of the year they reach the age of 7, until the last day of the school year in which they turn 15 or reach grade 9, whichever comes first (Republic of South Africa, 1996).

However, there are concerns about the policy’s effectiveness. There is evidence of extensive grade repetition and high dropout rates in the South African education system. van der Berg et al. (2019) report that average repetition rates in grades 9 to 11 are highest, relative to all other grades, exceeding the national repetition average of 10%; furthermore, repetition in grade 10 is highest, averaging 21% during the period 2014–2018. Moreover, between 58% and 60% of young people dropped out of the schooling system after the compulsory schooling phase, i.e., after the year they turned 15 or reached grade 9 (Branson and Leibbrandt, 2013b; Hartnack, 2017). Thus, completed education levels, which were low before the policy was instituted, remain low (Branson and Leibbrandt, 2013a; Case and Deaton, 1999; Case and Yogo, 1999), raising questions about the policy’s impact on schooling success, and, by extension, labour market outcomes.

This research attempts to offer insight into the policy’s effectiveness, as measured by wage outcomes corrected for selection into employment. Specifically, we examine whether the distribution of the returns to education for individuals subjected to the CSL are different to those who were not affected by the law. The analysis employs a quantile selection model, recently introduced by Arellano and Bonhomme (2017), to estimate the returns to education along the earnings distribution for black male and female South Africans. This approach, spanning the entire wage distribution, offers advantages over mean regressions, enabling a nuanced exploration of the variation in returns, as well as its interaction with unobserved factors that influence employment outcomes. Thus, the analysis offer insights crucial for addressing labour market related inequality. The investigation draws on data from the 2018 South African General Household Survey (Statistics South Africa, 2019).

The study contributes to the literature in a number of ways. Firstly, it presents a comparison of the returns to education received by individuals exposed to the compulsory education reform against those who were not. Given that the reform itself is exogenously imposed, the comparison allows for some inference into the effectiveness of the policy.

Secondly, it applies a recently introduced approach for correcting sample selection bias in quantile regressions; few researchers have considered the effect of sample selection when it comes to the distribution of returns to education. Given the extent of unemployment in the country, 36,5% in 2023 among black Africans (see Figure A.1), selection into employment could be an important component of the total returns estimate. Thirdly, it adds to the literature by estimating returns to education for both males and females across the wage distribution taking into account selection into employment. Fourthly, given the estimates, it is possible to infer whether selection into employment worsens inequality, especially amongst the younger employment cohorts for whom the end of apartheid might be expected to benefit. Fifthly, The analysis also offers the first update of estimated returns to education along the wage distribution in South Africa in nearly 27 years (Mwabu and Schultz, 1996).

South Africa, marked by a Gini coefficient of 0.69, stands as one of the most unequal nations globally (Mosomi et al., 2020). The labour market is a significant contributor to income inequality, evidenced by a wage Gini of 0.634 (Mosomi et al., 2020; Wittenberg, 2017b). A notable 83% of households without employed members experience poverty, a figure that contrasts with 50% for those with at least one wage employee (Finn, 2015). The study focuses on black South Africans for two reasons. First, they are the population majority, representing 81.4% of the total populace (Statistics South Africa, 2023). Second, they are believed to have been impacted the most by the compulsory schooling policy. According to Patrinos et al. (2021), compulsory schooling reform is expected to impact those at the lowest end of the distribution of educational attainment. Black Africans lag in educational attainment compared to others, because apartheid limited their access to quality education (Thobejane, 2013).

In South Africa, the relationship between education and the earnings distribution has included both race and gender; however, most analyses focus on mean returns¹. Furthermore, black African women are under-represented in high-skilled and management positions (Espinoza et al., 2019), suggesting that there are likely to be differences in the earnings distributions for men and women. With the exception of Mwabu and Schultz (1996), most distributional analysis studies the gender wage gap along the wage distribution. For instance, Ntuli (2007) investigate this gap between black African men and women, while Mosomi (2019) explore its evolution from 1993 to 2015. However, neither consider sample selection, the inclusion of which could alter their conclusions.

Although assessing schooling returns across the wage distribution dates back at least

¹See, for example, Bhorat (2000); Bhorat and Goga (2012); Biyase and Zwane (2015); Branson et al. (2013); Branson and Leibbrandt (2013b); Depken et al. (2019); Fryer and Vencatachellum (2005); Hertz (2003); Keswell and Poswell (2002, 2004); Moll (1992, 1998); Mwabu and Schultz (2000); Nikolov et al. (2020); Salisbury (2016); Zwane (2020)

to [Buchinsky \(1994\)](#), few have considered CSLs. [Buchinsky \(1994\)](#) assess returns to education across the earnings spectrum using U.S. data, finding that returns to education are higher at upper quantiles of the earnings distribution. The results suggest that individuals with greater abilities receive more substantial rewards in the labour market, compared to those with lower abilities – an indication of complementarity between ability and education ([Patrinos and Sakellariou, 2006](#)). Such results also imply that education increases earnings inequality. Similar results are available for Portugal ([Hartog et al., 2001](#)), a group of 16 developed countries ([Martins and Pereira, 2004](#)), a different group of European countries ([Prieto-Rodriguez et al., 2008](#)), and India ([Mitra, 2019](#)). In Ethiopia, [Girma and Kedir \(2005\)](#) find that returns decline along the distribution of wages in their two-stage quantile regression model.

The literature also points to differences by gender and level of economic development. [Patrinos and Sakellariou \(2006\)](#) find higher returns for women than for men in Venezuela, a phenomenon that is common ([Dougherty, 2005](#)). On the development front, [Patrinos et al. \(2006\)](#) observed decreasing returns at higher levels of the wage distribution in low-income countries (Mongolia, Cambodia, Vietnam, Indonesia, Thailand, and the Philippines) and increasing patterns in high-income countries (Singapore). In South Africa, [Mwabu and Schultz \(1996\)](#) find differences across race groups – declining returns at higher levels of education for black South Africans and increasing returns for white South Africans.

One concern that arises in the analysis of education returns is the potential for sample selection. The impact of sample selection on the mean wage function goes back to [Gronau \(1974\)](#) and [Heckman \(1974\)](#); selection has received limited attention in the quantile wage function. [Buchinsky \(1998\)](#) introduces a quantile selection model that [Buchinsky \(2002\)](#) follows to estimate returns to education for women in the U.S finding significant selection bias over the wage distribution across all ages. [Staneva et al. \(2010\)](#), on the other hand, using the same method for Bulgaria, Russia, Kazakhstan and Serbia, finds selection bias in Russia and Kazakhstan for both males and females; correcting for the bias leads to lower returns for women in both countries.

However, the [Buchinsky \(1998\)](#) correction makes an implicit independence assumption between the error term and the regressors, conditional on the selection probability, and, therefore, may not be appropriate. The assumption implies that all quantile regression curves are parallel to each other, such that the quantile regression coefficients are identical to each other and equal to the mean regression coefficients ([Huber and Melly, 2015](#)). [Arellano and Bonhomme \(2017\)](#) overcome this challenge through the non-random selection process that may be present in the data across the distribution. This allows for more accurate estimation of the conditional quantile functions and, hence, heterogeneous

returns to education across the wage distribution. Therefore, we follow [Arellano and Bonhomme \(2017\)](#).

Although focused on the gender wage gap, one recent analysis to follow [Arellano and Bonhomme \(2017\)](#) is [Elass \(2024\)](#), who investigates the evolution of the gender wage gap across the distribution for three European countries - the UK, France and Finland - finding different selection patterns across the countries. They observe positive selection into employment in France, but negative selection in both the UK and Finland, finding negative selection for both males and females in the UK, but only for females in Finland. Positive (negative) selection implies that the wages of those that are employed are higher (lower) compared to those that are unemployed. In a related analysis, [Maasoumi and Wang \(2019\)](#) find negative selection for U.S women when “employment rates are extremely low and positive selection with relatively higher employment.”

The findings of our analysis reveal that returns to education are heterogeneous by compulsory schooling exposure, educational level, gender, and along the wage distribution. We find, similar to others, that returns for women exceed those for men. This could be due to education’s “double effects” on women’s earnings ([Dougherty, 2005](#)): education increases women’s productivity, as it does for men, but can mitigate gender norms that contribute to the gender wage gap (such as labour market discrimination). We also find that women exposed to the schooling law tend to earn more than women not exposed. For men, a similar conclusion arises, but only at higher quantiles of the wage distribution; it is the opposite for men at the bottom of the wage distribution.

In terms of selection, female returns suffer; correcting for selection lowers their returns between 0.9 and 4.4 percentage points, depending on the location on the wage distribution. Despite that, correcting for selection does not reverse the returns ranking for women, at least when the comparison is before and after the compulsory schooling law was implemented. Furthermore, the results suggest that compulsory schooling has worsened skills-bias and wage inequality. This arises from an analysis focused specifically on levels of education, rather than years of education. We find that returns increase by level of education, rising from the bottom end to the top end of the wage spectrum for both females and males. The results – increasing returns across the wage distribution, except at the extreme top, suggest a skills-biased structure to the labour market that increases inequality.

2 Impact of labour laws

Following the end of apartheid in 1994, the democratic government introduced several laws that may have impacted the structure of the labour market. These labour laws aim to dismantle the raced-based policies and practices that existed during the apartheid era. At the time, the labour market was configured in favour of the white minority, to the disadvantage of the majority non-white population: better employment opportunities and conditions were reserved for whites ([Burger et al., 2010](#); [Festus et al., 2016](#); [Horwitz and Jain, 2011](#); [Landman et al., 2020](#)).

The legal instruments introduced after 1994 include the: Labour Relations (LR) ([Republic of South Africa, 1995](#)), Basic Conditions of Employment (BCE) ([Republic of South Africa, 1997](#)), Employment Equity (EE) ([Republic of South Africa, 1998](#)), and Broad-Based Black Economic Empowerment (B-BBEE) ([Republic of South Africa, 2004](#)) Acts. The LR Act was introduced to give workers several rights, including: collective bargaining, union membership and the right to strike. The BCE Act aims to ensure equitable basic employment conditions, such as: annual leave, sick leave, leave gratuity, and severance pay. In addition, the BCE Act makes provision for sector-specific minimum wages² ([Piek et al., 2023](#)), which are determined either through the sector bargaining councils or sector determinations by the Employment Conditions Commission (ECC).

The national minimum wage law was only introduced in 2019. Therefore, most of the empirical work on minimum wages focus on specific sectors or sector. The impact of minimum wage laws on labour market outcomes is heterogeneous. For example, [Bhorat et al. \(2013\)](#) find that minimum wage laws increased real hourly wages in the security, retail and domestic work sectors by between 0.3 and 0.4%; however, they find that minimum wage laws decreased real wages by about 0.3% in the taxi sector, but had statistically insignificant effect in the forestry sector. Similarly, [Bhorat, Kanbur and Stanwix \(2014\)](#) find that the agricultural minimum wage law increased wages of farm workers by an average of 7%. As might be expected, [Millea et al. \(2017\)](#) find that minimum wage laws affected the wages of black Africans and coloureds only, not whites. [Bhorat et al. \(2021\)](#) find mixed impacts of the national minimum wage (NMW) on wages. In their cross-section analysis, they find no statistically significant effect, while the panel analysis yields a statistically significant effect of 15.9%. However, they caution that the estimates should be interpreted with care, as the results might be influenced by the relatively short panel employed and non-compliance by employers.

²The following industries had minimum wages set by law: children's work in advertising, creative, and cultural endeavours; contract cleaning; private security; wholesale and retail; farm work; forestry; taxi; learnership; hospitality; civil engineering; and domestic work ([Millea et al., 2017](#)).

The EE Act introduced affirmative action (AA) in the workplace to enhance employment opportunities for previously disadvantaged groups such as black Africans, coloureds, Indians, women, and people living with disabilities. To achieve this, employers are required to formulate employment equity plans with numerical targets and measures to eliminate discriminatory barriers and foster workplace diversity (Burger et al., 2010). The policy applies to firms employing at least 50 employees or firms employing less than 50 employees, but whose income exceeds a pre-determined threshold³.

However, the commission for employment equity report of the Department of Employment and Labour for 2022/23 shows a disproportionate representation across the various population groups. Although black Africans constitute 80.0% of the economically active population (EAP), they occupy only 16.9% of top management positions, both in the private and public sector, in sharp contrast to whites who occupy 62.9% of top management positions, but comprise only 8% of the EAP (Department of Employment and Labour, 2023). On the gender front, black African and coloured women remain underrepresented in high-skilled and managerial roles, predominantly working in low-paid and low-skilled positions (Espí et al., 2019). Decomposition analysis suggests that AA policy is far less important than education in explaining wage gaps (Burger et al., 2010).

Finally, the B-BBEE Act was introduced to promote black economic empowerment. The Act has several targets for empowering black people⁴. Empowerment is broad capturing, amongst others: ownership and management, skills development for employees, enterprise and supplier development for black-owned businesses, and socio-economic development. The B-BBEE regulations set specific targets for black economic empowerment in each of these areas. For example, the B-BBEE regulations mandate a 60-30 rule in designated enterprises: 60% of senior management positions should be held by blacks, of which 30% should be reserved for black women (Baker and McKenzie, 2023). Klasen and Minasyan (2021) find that wages for white male senior managers increased approximately 30%, but remained unchanged for blacks.

In summary, despite the commendable efforts by government, the overall evidence suggests limited progress in addressing racial and gender inequities in the labour market, at least through direct targeting in the labour market. Possibly, indirect targeting via compulsory schooling was more successful. We explore that further, below.

³According to Schedule 4 of the Employment Equity Amendment Act 2013, the thresholds per sector range from R6 million for the agriculture sector to R75 million for wholesale trade, commercial agents and allied services (Republic of South Africa, 2014).

⁴According to the Act "black people" is used generically to refer to Africans, Coloureds and Indians.

3 Estimation Strategy

The main objectives of this research are to examine returns along the wage distribution, investigate whether there is a statistically significant difference based on exposure to the CSL, and to determine whether selection increases or decreases returns. To address potential returns heterogeneity, we apply the conditional quantile regression (QR) model [Koenker and Bassett Jr \(1978\)](#). We incorporate a CSL dummy and interaction with schooling to capture the CSL differences. Finally, we extend each of these to account for selection into the workplace via [Arellano and Bonhomme \(2017\)](#). The details follow.

3.1 Quantile regression

Let y be a continuous outcome variable and x be a vector of covariates. The quantile regression is specified as

$$Q_\tau(y|x) = x'\beta_\tau \quad (1)$$

where $\tau \in (0, 1)$, and $x'\beta_\tau$ is strictly increasing in τ . The estimation of β_τ involves minimizing the weighted absolute deviations from the regression line, and is solved via linear programming:

$$\min_{\beta} \left\{ \sum_{i:y \geq k} \tau |y - x'\beta_\tau| + \sum_{i:y < k} (1 - \tau) |y - x'\beta_\tau| \right\} \quad (2)$$

where $k \equiv x'\beta_\tau$. Furthermore, $\tau|k$ is the penalty for under-prediction, when the actual value of y is higher than its predicted value. Conversely, $(1 - \tau)|k$ is the penalty for over-prediction, if y is lower than its prediction. Because the penalties are linear, rather than squared, quantile regression is more robust to outliers than is ordinary regression.

To estimate returns, we include schooling in the regression. To assess the difference across CSL exposure, we include a CSL exposure indicator, as well as its interaction with schooling (as well as additional covariates):

$$Q_\tau(w|X, S) = X'\alpha_\tau + CSL\theta_\tau + S\gamma_\tau + \delta S_\tau \times CSL \quad (3)$$

where w denotes the logarithm of monthly wage or earnings; S , is years of education; X , is a vector of covariates consisting of age, gender, marital status, province of residence, and survey year. CSL is a dummy variable to capture compulsory schooling (exposed = 1, and 0 = otherwise). α_τ is the return to X at the τ^{th} quantile, and γ_τ is the return to education at the τ^{th} quantile for those who were not exposed to the CSL. With respect

to the CSL, θ captures the average difference in (log) monthly wages for those exposed, relative to those not, while δ is the marginal difference in returns to education between individuals who were affected by the CSL and those who were not. Equation (3) is estimated separately for females and males.

3.2 Quantile selection model

Two concerns often arise when considering the returns to schooling. One is the potential endogeneity of schooling; the other is the potential for selection into employment. Addressing endogeneity requires an instrument that yields variation in schooling outcomes that is exogenous to wages – certainly the compulsory schooling law could be used (Balestra and Backes-Gellner, 2017; Brunello et al., 2009). Although both are likely to impact returns estimates, we focus our attention on employment selection in this analysis. The reason for doing so arises from the depth of unemployment in the country – approximately 37% for the population that underpins the sample – which means that a large share of possible workers are not working and, thus, are not earning a wage.

As a result, estimates derived from the standard quantile wage regression are prone to bias, leading to inaccurate statistical inferences about the broader population (Blau et al., 2024). In addition, there are complications arising from attempting to separate schooling endogeneity and sample selection across the quantiles. Thus, implicitly, we are assuming that the underlying endogeneity is constant over time. We also assume that the CSL is exogenously given. Thus, the CSL interaction can be interpreted as the difference in the returns to education arising from exposure to the CSL.

Moreover, Arellano and Bonhomme (2017) offers more flexibility, since it does not require rank invariance, and, therefore, does not disregard the plethora of potential patterns associated with sample selection. While the rank invariance assumption postulates that the effect of the instrument (in this study, number of children below the age of 6) on the conditional quantiles of wages remains consistent across all quantiles, that assumption is empirically unlikely (Elass, 2024). Thus, we accommodate quantile-specific heterogeneity in the treatment effects of the outcome variable, unlike conventional models.

To set the stage, we consider a general outcome specification, where the quantile function is a linear index, as in Arellano and Bonhomme (2017).

$$Y^* = Q(U, X) = X' \beta_\tau \tag{4}$$

where Y^* is the latent outcome variable, i.e wage offers, the function Q is the τ th con-

ditional quantile of Y^* , given the covariates X , and U is the error term of the wage equation. X is a vector of covariates as defined before, consisting of years of education (or grade completion), age, marital status, and province of residence. The selection equation (employment equation) is defined as

$$D = 1\{V \leq p(Z)\} \quad (5)$$

where $D = 1$ represents employment; $D = 0$ otherwise, Z contains all X variables and E , a variable that is excluded from the wage equation. In this case, we use the number of children in the household under the age of 6 as an instrument for employment, since it is likely to affect employment, but not directly influence wages. The number of young children has been used in similar studies (Maasoumi and Wang, 2019; Staneva et al., 2010). $p(Z)$ is a propensity score, which describes the selection probability of individuals with characteristics Z , and V is an error term in the selection equation. The main assumption of the model is the exclusion restriction, where E is assumed to be independent of U and V , given X (Elass, 2024).

The connection between the quantiles of the distribution of observable outcomes Y and those of the distribution of potential outcomes Y^* is created through the following expression (Arellano and Bonhomme, 2017):

$$\begin{aligned} P(Y^* \leq X'\beta_\tau \mid D = 1, Z = z) &= P(U \leq \tau \mid V \leq p(Z), Z = z) \\ &= C_{U,V|X=x}\{\tau, p(z)\} \\ &= G_x\{\tau, p(z)\} \end{aligned} \quad (6)$$

where $G_x \equiv C(\tau, p)/p$ is the conditional copula function, which measures the dependence between U and V . Estimation is carried out via three steps. First, equation (5) is estimated via probit to obtain the propensity scores. Second, equation (6) is estimated by minimising the method-of-moments objective function to recover the copula parameter, which measures the correlation between the error terms in the wage and employment equations. Third, the propensity scores and G_x are used to consistently estimate β at each quantile of the wage distribution (Muñoz and Siravegna, 2021). Maasoumi and Wang (2019) and Elass (2024) apply this approach to estimate selection-corrected gender wage gaps across different quantiles.

The copula parameter relates to the mechanism underpinning selection into employment through its sign (Maasoumi and Wang, 2019). On the one hand, a negative indicates of positive selection, employed individuals have characteristics that result in higher wages compared to the entire population. For a typical example, higher ability people might be more likely to be employed and earn higher wages (Maasoumi and Wang, 2019). On

the other hand, a positive value signals negative selection, implying that the employed have lower wages, compared to the broader population. Examples include labour market constraints or social policies that incentivize the employment of individuals with lower earning potential (Dolado et al., 2020; Granados et al., 2020).

For comparison purposes, we also report selection estimates at the mean arising from Heckman (1979). The main difference between Heckman (1979) and Arellano and Bonhomme (2017) arises in the additivity assumption associated with the unobserved factors. Heckman (1979) allows the propensity score to enter linearly, as is common in the control function literature, while Arellano and Bonhomme (2017) show this assumption is unlikely to be appropriate in the non-linear quantile setting.

3.3 Data

The data used for this analysis come from the 2018 South African General Household Surveys (GHS). We excluded non-black Africans (11,596), those with incomplete birth date information (166), those younger than 15 or older than 65 (22,674), those who are economically inactive (15,660), those with zero or missing wage data (141), and those with missing educational levels (360). We limit our analysis to labour force participants between the ages of 21 and 65; thus, we focus on those who have completed their compulsory phase, as well as those who have not yet reached retirement age. Consequently, the analysis is based on 20,540 individuals, including 9,901 women and 10,639 men.

The primary variables in the analysis are gross earnings, years of education (or the categorical completed grades measure) and exposure to the CSL. Importantly, we were able to access birth dates for each individual from Statistics South Africa (StatsSA), which are used to determine whether or not an individual was subjected to the CSL.⁵

The dependent variable is gross earnings, which includes overtime, allowances, bonuses and any deductions before tax. The years of education for each individual are derived from the highest level of education completed.⁶ Years of education is commonly used in the literature; see Andini (2010), Borat and Kimani (2017) and Liwiński (2020) for South Africa and Poland, respectively, for just a few examples.

⁵The CSL went into effect on January 1, 1997. Schooling then became compulsory for all individuals aged 7 to either age 15 or grade 9. Thus, everyone with a 15th birthday in 1997 was affected, as was anyone younger than that. In other words, everyone born on or after January 1, 1982 was affected by the law.

⁶The South African education system offers a number of different routes and qualifications; this includes a number of different options related to the completion of secondary education, for example Table A.1 in Appendix A describes the derivation of education from the highest level completed variable

In addition to the primary variables, we also control for a number of potential confounding variables. We include age to proxy for labour market experience, similar to (Torun, 2018). Age is interacted with CSL to control for differences in age between the treated and untreated groups. We include province of residence to capture local differences in the labour market; geographical variables are also relatively common in the literature, such as Depken et al. (2019) and Biyase and Zwane (2015) for South Africa, and Stefani et al. (2006) for Brazil. We also include marital status, which is correlated with earnings in a number of studies (Bardasi and Taylor, 2008; Biyase and Zwane, 2015; Depken et al., 2019).⁷

As noted earlier, the model attempts to address potential selection bias, which requires an instrument for the identification of the correlation between the unobserved factors affecting both wages and employment. In this analysis, we use the number of children in the household below age 6 as the instrument for employment. Staneva et al. (2010) use a similar variable for identification. The number of children, especially younger children, is believed to negatively impact female labour supply (Liu and Marois, 2023), because it takes more time and energy to care for more children leaving less time and energy for employment. However, Markussen and Strøm (2022) find that whilst women’s labour supply is negatively affected by the number of children, men’s labour supply increases. Further, they find the impact of children on labour supply to be heterogeneous along the distribution.

Finally, we separate the analysis by gender. Depken et al. (2019) find that, in South Africa, being female is associated with 32.5% lower wages. Such large differences in average wages, as well as gender wage gap decomposition research suggesting differences in returns to various endowments (Mosomi, 2019), suggests that it is beneficial to allow for gender differences in the returns to education.

4 Results

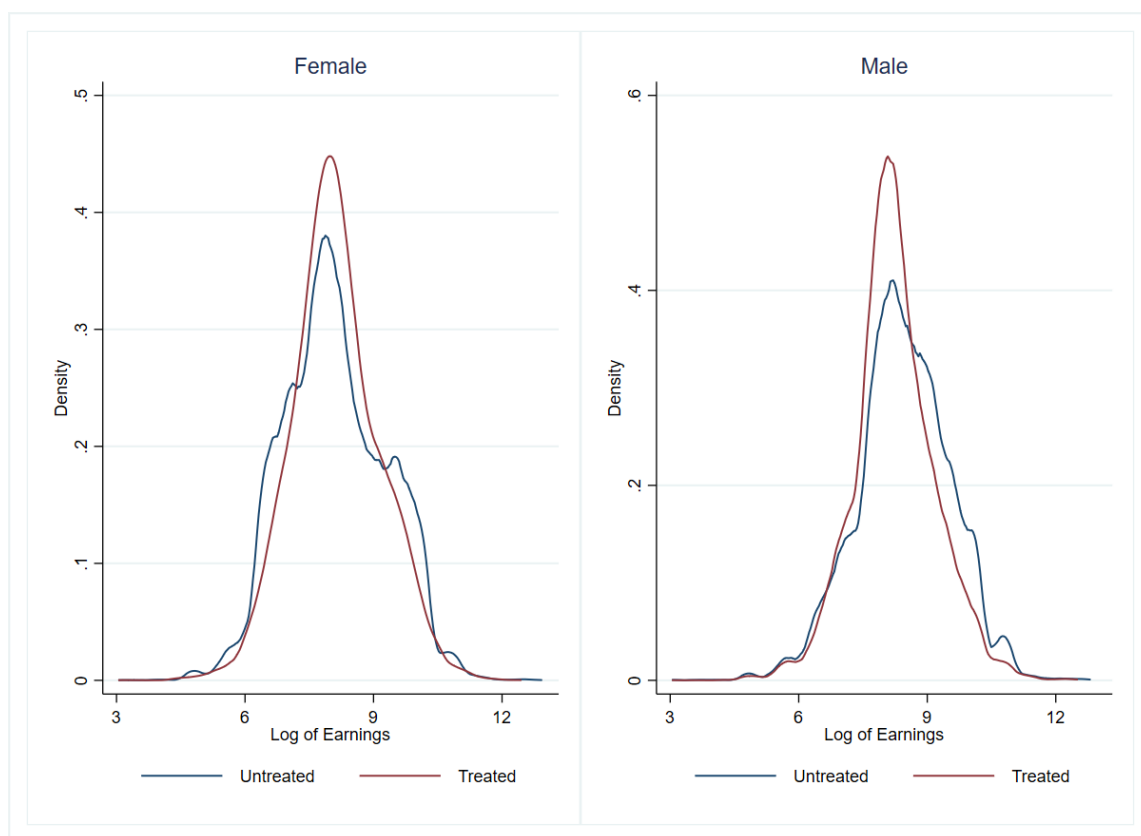
Below, we describe the main features of the data and present the model estimates.

⁷There are a multiple legal marriage options in the country, including traditional/customary or civil/religious marriages; therefore, all of these are used to define legally married; in terms of interpretation, the reference category is ‘not legally married’. Although marital status might also be endogenous, We are not directly interested in the effect of marriage on wages; thus, we do not worry about the possibility here.

4.1 Descriptive statistics

Given our focus on the distribution of returns to wages, we present wage densities, conditional on employment, for both men and women, before and after the CSL. See Figure 1, where "treated" refers to those who were subjected to the CSL. For both males and females, exposure to the CSL is associated with a smoother density, which may reflect differences in labour market experience and educational attainment between the groups.

Figure 1: Distribution of log monthly earnings by gender and treatment status



Source: Author's calculations based on the sample data.

As suggested – see the summary statistics, split by CSL exposure and gender in Table 1 – there are differences in both education and age, the latter of which is expected to relate to work experience, across the treatment groups. Exposed females have more education, 11.4 years, on average, compared to 10.1. Similarly, the proportion of treated females completing grade 11 (19%) and 12 (45%) exceeded that of the untreated women for grade 11 (14%) and grade 12 (27%). However, the untreated group has a higher proportion of individuals with tertiary education (16%) compared to the treated group's 14%.

Despite more years of education, the treated group earns only 82.1% (7,028.49/8,563.62)

of the untreated group’s monthly wages. Similarly, the employment rate is lower amongst the treated (56%) compared to the untreated (82%), and there is an approximately double marital rate. Thus, at least some share of the difference in wages is likely related to life-cycle patterns.

Table 1: Summary statistics for women and men by compulsory schooling treatment exposure

	Females			Males		
	Control Group	Treated Group	Difference	Control Group	Treated Group	Difference
	Mean	Mean	b	Mean	Mean	b
Age	47.12	29.49	17.63***	46.95	29.44	17.51***
Education	10.09	11.42	-1.33***	9.77	10.89	-1.12***
Primary	0.20	0.04	0.16***	0.23	0.08	0.15***
Grade 8	0.05	0.03	0.02***	0.06	0.04	0.02***
Grade 9	0.06	0.05	0.01***	0.06	0.08	-0.02***
Grade 10	0.11	0.10	0.01	0.12	0.13	-0.01
Grade 11	0.14	0.19	-0.04***	0.14	0.18	-0.05***
Grade 12	0.27	0.45	-0.18***	0.27	0.39	-0.12***
Tertiary	0.16	0.14	0.02**	0.12	0.10	0.02***
Employed	0.82	0.56	0.26***	0.85	0.66	0.20***
Monthly Earnings	8563.62	7028.49	1535.13***	11082.30	8066.22	3016.08***
Legally married	0.35	0.15	0.20***	0.48	0.12	0.36***
Western Cape	0.05	0.06	-0.01***	0.06	0.06	-0.00
Eastern Cape	0.26	0.19	0.06***	0.21	0.19	0.02*
Northern Cape	0.03	0.03	0.00	0.03	0.03	0.00
Free State	0.07	0.06	0.00	0.06	0.06	0.00
KwaZulu-Natal	0.17	0.21	-0.04***	0.15	0.20	-0.04***
North West	0.06	0.06	0.00	0.08	0.07	0.01***
Gauteng	0.29	0.29	0.00	0.32	0.31	0.01
Mpumalanga	0.10	0.11	-0.01**	0.10	0.10	-0.00
Limpopo	0.11	0.08	0.03***	0.10	0.09	0.01*
Observations	5025	4876	9901	5122	5517	10639

Notes: p-values come from the t test comparing individuals exposed and not exposed to the compulsory schooling law.

As was the case with the women, CSL-exposed males are 17.5 years younger. The difference in average years of education between the two groups is 1.1 years in favour of the CSL group, with a higher grade 12 (39%), grade 11 (18%), and grade 10 (13%) completion rate, compared to those not exposed at 27%, 14%, and 12%, respectively. However, the untreated have more tertiary education (12%) compared to the treated’s 10%. CSL-males earn only 72.8% (8,066.22/11,082.30) of the wages of non-CSL men, a lower share than observed for women. This wage difference is statistically significant. Similar to what was observed for women, some of the wage differences are likely due to life cycle patterns, since the untreated are 1.6 times older and have a marriage rate that is 4 times higher. Turning to employment, 85% of untreated men are employed, compared to 66% of the treated.

As expected, labour market outcomes vary by gender. Men have higher employment rates compared to women (85% vs 82% and 66% vs 56%). Women earn less than men. Whilst untreated women earn R8,563.62 per month, this is only 77.3% of untreated men’s monthly wage of R11,082.30. Similarly, treated women earn only 87.1% (7,028.49/8,066.22) of their male counterparts. The treated-untreated male-female, approximately a difference-in-difference (DD), wage gap is in favour of men, despite the

DD education gap (at least for grade 11 and 12) favouring women. Relatively low female wages suggests their over-representation in low-paying jobs, as suggested by [Espí et al. \(2019\)](#).

4.2 Quantile regression

The main objective of this study is to investigate whether individuals exposed to the compulsory schooling policy experience higher returns to education compared to those who were not subjected to the policy. To answer this question, education is interacted with a dummy variable for compulsory schooling exposure to assess whether there is a statistically significant difference between the returns to education of individuals who were exposed to the law and those who were not.

Estimates are available for both males and females, and, as a benchmark to the main results, the mean returns are estimated via OLS. The estimates are reported at 5 distinct locations of the wage distribution, that is, at the 10th, 25th, 50th, 75th and 90th quantiles (Q10, Q25, Q50, Q75 and Q90, respectively). The estimates are presented in [Table 2](#), the rest of the results are shown in [Tables A.2](#) and [A.3](#) in [Appendix A](#).

Returns to education

Those exposed to the CSL are earning only approximately 77%⁸ of those who were not exposed. The densities, see [Figure 1](#), suggest fewer high wage earners, either male or female, amongst those exposed; this is also observed in the regressions – see the “CSL” parameter estimates. For females at the 75th and 90th quantile of wages, exposure to the CSL was associated with at least a 30% reduction in earnings. For males at the same location of the distribution, exposure was associated with a 17% (or greater) reduction in earnings. Given the large age differences between the groups, and, presumably, large differences in experience, such differences are not unexpected.

Even though wages are, on average, lower, returns to education are generally found to increase along the distribution of earnings, and higher, although not always statistically significantly so, for the treated.

Among females, the return to an additional year of education increases along the wage distribution, from 9.3% at Q10 to 15.0% at Q50 before slightly dropping to 14.3% at the

⁸[Table 1](#): Wages for treated individuals = R8,066.22 + R7,028.49 = R15,090.71. Wages for untreated individuals = R11,082.30 + R8,563.62 = R19,645.92. Wages of the treated group as a percent of wages of the untreated group = R15,090.71/R19,645.92 = 77%.

Table 2: Returns to education for women and men estimated via OLS and quantile regression

	(1) Mean	(2) Q10	(3) Q25	(4) Q50	(5) Q75	(6) Q90
Females						
Education	0.139*** (0.004)	0.093*** (0.007)	0.145*** (0.007)	0.150*** (0.005)	0.143*** (0.005)	0.130*** (0.006)
CSL	-0.565** (0.237)	-1.427*** (0.321)	-0.701** (0.293)	-0.480* (0.253)	-1.064*** (0.282)	-0.293 (0.363)
CSL × Education	0.023** (0.011)	0.067*** (0.019)	0.025* (0.014)	0.026** (0.012)	0.034*** (0.013)	0.021 (0.013)
Males						
Education	0.101*** (0.005)	0.092*** (0.007)	0.103*** (0.007)	0.109*** (0.004)	0.108*** (0.004)	0.097*** (0.008)
CSL	-0.542*** (0.195)	-1.012*** (0.282)	-0.604*** (0.211)	-0.338* (0.205)	-0.584*** (0.210)	-0.174 (0.321)
CSL × Education	0.001 (0.008)	-0.006 (0.012)	-0.003 (0.010)	0.001 (0.009)	0.003 (0.008)	-0.001 (0.010)

Notes: (1) All equations include the following additional control variables: age, marital status, and province. (2) In parentheses are standard errors. (3) ***, **, and * indicate significance at the 1, 5, and 10% critical level. (4) CSL = 1 if individual i was subjected to the compulsory schooling law (CSL), CSL = 0 otherwise. (5) F-test for females: Education = 2.40 with p-value = 0.048. F-test for females: CSL × Education = 32.86 with p-value = 0.000. (6) F-test for males: Education = 0.19 with p-value = 0.946. F-test for males: CSL × Education = 2.51 with p-value = 0.040.

Q75 and further to 13.0% at Q90. These estimates represent the returns for untreated women. The F-test focusing on education across the distribution suggests that the returns are heterogeneous along the wage distribution (see note (5) under Table 2). The treatment effect on returns, i.e., the change in returns arising from exposure to the CSL is captured by the coefficient on the interaction, CSL × Education. For women, this is positive and statistically significant at all selected quantiles, except the 90th percentile, suggesting that women’s returns to education are 2.5-6.7% higher, because of CSL exposure, at any (selected) quantile.

The additional return appears to follow a declining trend, with relatively higher improvements at the lower end of the distribution. When combined, the returns to education for CSL-exposed women are increasing along most of the wage distribution: 16.0%, 17.0%, 17.6%, 17.7%, and 15.1% at Q10, Q25, Q50, Q75, and Q90, respectively. Moreover, the F-test for the interaction term along the distribution is statistically significant (see note (5) in Table 2), suggesting that the treatment effect is heterogeneous along the earnings distribution.

For men, estimated returns are increasing along the earnings distribution, rising from 9.2% at Q10 to 10.9% at Q50, before dropping to 10.8% at Q75 and further to 9.7% at Q90. The F test is not statistically significant (see note (6) in Table 2), and, therefore, one can conclude that wages are homogeneous along the distribution. Moreover, the coefficient of the interaction term, CSL × Education, is not statistically significant at any of the selected quantiles of the wage distribution. This suggests that exposure to the CSL did not affect the conditional distribution of earnings.

Returns to education level

In addition to estimating the returns to an additional year of education, the returns are also estimated for each grade completed. The levels of education considered are primary, grades 8, 9, 10, 11 and 12 as well as tertiary education. Primary is the reference category. To assess the difference between returns of treated and untreated individuals, the dummy variable for CSL is interacted with the dummy variable for grade completion. For example, $\text{CSL} \times \text{Grade 9}$ is the interaction term between CSL and Grade 9 completion. We focus on that, because the CSL is meant to affect Grade 9 completion.

Table 3 shows the rate of return to grade completion along the wage distribution for females and males, respectively. Only results for key variables are shown in these tables. The rest of the results are contained in Tables A.4 and A.5 in Appendix A. The top

Table 3: Returns to grade completion for women and men estimated via OLS and quantile regression

	(1) Mean	(2) Q10	(3) Q25	(4) Q50	(5) Q75	(6) Q90
Females						
Grade 9	0.206*** (0.070)	0.206*** (0.074)	0.243** (0.095)	0.199*** (0.073)	0.084 (0.070)	0.249** (0.123)
CSL	-0.467** (0.184)	-0.776*** (0.257)	-0.426** (0.201)	-0.310* (0.185)	-0.473** (0.226)	-0.262 (0.371)
CSL \times Grade 9	0.021 (0.035)	-0.030 (0.043)	-0.009 (0.046)	0.054* (0.031)	0.075* (0.045)	-0.050 (0.085)
Males						
Grade 9	0.178*** (0.069)	0.219** (0.087)	0.129 (0.101)	0.135* (0.075)	0.205* (0.124)	0.293*** (0.096)
CSL	-0.639*** (0.163)	-1.186*** (0.283)	-0.928*** (0.206)	-0.585*** (0.147)	-0.391** (0.188)	0.002 (0.265)
CSL \times Grade 9	0.024 (0.029)	0.094** (0.039)	0.082** (0.038)	0.050* (0.028)	-0.014 (0.047)	-0.056 (0.038)

Notes: All equations include the following additional control variables: age, marital status, and province. Bootstrapped standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10% critical level. CSL = 1 if individual i was subjected to the compulsory schooling law, CSL = 0 otherwise.

panel of Table 3 presents the results for females. we find two important differences between Tables 2 and 3. The first is that the return from one grade to the next is not constant (see Table A.4 in Appendix A), regardless of whether we focus on the mean or any specific quantile. Second, although there is evidence of heterogeneity in returns to any particular grade, returns generally follow an inverse U -shape, at least for higher levels of completed education. Thus, an assumption of constant returns, as is assumed in the model underscoring the previous results, is not appropriate. Instead, much of the difference in returns across the treated and untreated groups appears to relate to the completion of grade 12 and university education, not exposure to the CSL on its own.

The coefficient for each completed grade is statistically significant and positive throughout most grades/levels of education and across most percentiles of the wage distribution being considered (except for grade 8 at Q10 and Q25, and grade 9 at Q75). Although we do

not undertake a formal test, it is also clear that the confidence intervals for coefficients for most of the education levels do not overlap (within a column); thus, the returns differ by grade level.

The return to grade 9 for untreated female workers is estimated to be approximately 20.6%, on average. It increases from 20.6% at Q10 to 24.3% at Q25, falls at the median to 19.9% and increases again at Q90. The coefficient for the interaction term between grade 9 and the compulsory schooling dummy is positive and statistically significant only at Q50 and Q75. Thus, we find that the return to grade 9 is approximately 5.4% to 7.5% higher for those around the second to third quartiles of earnings. As before, the CSL leads to improved earnings for women.

The results for male workers are depicted in the bottom panel of Table 3. We also see a number of differences between the results reported in Table 2 and those reported in Table 3. Specifically, we see evidence that the CSL had led to lower wages at the bottom of the distribution, but higher wages at the top of the distribution. We also find, as we did with women, that the constant returns assumption is not entirely plausible. Furthermore, we do not see any obvious returns patterns across the earnings distribution, even though there is heterogeneity.

Recalling that the CSL is expected to impact returns related to grade 9, more than for any other grade, we focus our attention on grade 9 and its interaction with the CSL. Male returns to grade 9 are slightly lower than those for women: 17.8% for men (20.6% for women). However, returns do not follow either an increasing or decreasing pattern across the distribution, although they are lowest at Q25 (12.9%) and highest at Q90 (29.3%). For men, the CSL had the greatest benefit for the bottom half of wage earners, ranging from an additional 5.0% to 9.4%. Thus, for men, the CSL offered some respite by reducing earnings inequality amongst grade 9 completers.

4.3 Quantile selection model

It is possible that the estimated returns reported to this point are biased, due to the fact that they do account for selection into employment. Thus, we also estimated quantile selection models for females and males, which we report in Table 4. For comparison, we report the results estimated from the Heckman selection model, in addition to the quantile selection results. The probit estimates are estimated with employment as the dependent variable. Only key results are reported here; the rest can be found in Appendix A Tables A.6 and A.7.

Table 4: Returns to education for women estimated via the quantile selection model

	Mean		Quantile Selection Model					
	Probit	Heckman	Probit	Q10	Q25	Q50	Q75	Q90
Education	0.048*** (0.006)	0.126*** (0.005)	0.048*** (0.005)	0.094*** (0.007)	0.133*** (0.009)	0.141*** (0.007)	0.138*** (0.007)	0.115*** (0.011)
CSL	-0.848*** (0.253)	0.149 (0.300)	-0.848*** (0.248)	-1.003*** (0.376)	-0.240 (0.364)	-0.097 (0.384)	0.172 (0.681)	0.683 (0.616)
CSL × Education	0.022** (0.011)	0.012 (0.010)	0.022** (0.010)	0.057*** (0.020)	0.017 (0.014)	0.019 (0.012)	0.018 (0.018)	-0.008 (0.021)
Children under 6	-0.161*** (0.017)		-0.161*** (0.017)					
G_x (ρ)	-0.634*** (0.187)			0.494** (0.236)				

Notes: All equations include the following additional control variables: age, marital status, and province. Standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10% critical level. CSL = 1 if individual i was subjected to the compulsory schooling law, CSL = 0 otherwise. In the quantile selection model a positive sign for G_x (or ρ) indicates negative selection into employment (Arellano and Bonhomme, 2017; Maasoumi and Wang, 2019). Negative selection bias implies that potential wages of the working individuals are somewhat lower than those of the entire population (Granados et al., 2020).

The first takeaway from is that selection is statistically significant only for the women, even though the exclusion restriction (children under age 6) is statistically significant (and similar in magnitude) for both men (see Table A.7) and women. In other words, for women, there is correlation between the unobserved components of employment and wages; therefore, there is evidence of selection into employment, which biases the estimates of the previously reported quantile regressions. Staneva et al. (2010) find similar evidence for Russia and Kazakhstan. Given that we find this only for women, we only discuss results for them, below.

There are two relevant comparisons, one across the quantiles within the selection model, and the other comparing the selection model with the non-selection model. Beginning with the selection model – see Table 4 – we continue to see that returns to earnings are increasing from Q10 to Q50, falling slightly at Q75 and Q90. We also find that compulsory schooling has reduced earnings at Q10, but there is no statistically significant CSL effect at other locations across the distribution. At the margin, the CSL offers a small increase in returns to education at Q10, but not at other locations.

Comparatively speaking – see the top panel in Table 2 and Table 4 – returns to education are slightly lower, after correcting for selection. Furthermore, the treatment effect of the CSL, is estimated to be smaller, as well, and statistically significant only at Q10 following selection correction.

Table 4 indicates that G_x is positive, which corresponds to the presence of negative selection (refer to the section on the estimation strategy for further details). Similar results are available for the US, UK and Finland This result implies that women who opt out of employment tend to have higher potential wages compared to those who remain employed. This finding is somewhat unexpected, particularly in the context of South Africa, where structural and societal factors would typically suggest the opposite trend. One possible

explanation for this phenomenon could be that higher-earning women may have greater flexibility or alternative sources of income, enabling them to leave the labour market voluntarily. For instance, these women might prioritize other pursuits such as education, caregiving, or entrepreneurial activities. On the other hand, lower-earning women may feel compelled to remain employed due to financial necessity, even if the returns to their labour are relatively low. This observation challenges conventional assumptions about labour market participation in South Africa, where economic pressures and limited opportunities for women often drive different patterns of workforce engagement. Further investigation into the underlying causes of this negative selection is necessary to fully understand its implications for gender dynamics in the labour market.

However, similar results are available for the US, UK and Finland (Elass, 2024; Maasoumi and Wang, 2019). Maasoumi and Wang (2019) find that negative selection among US women happens during periods of low employment rates. Given the high unemployment rate for women in South Africa, high-wage women may leave the labour market to pursue other interests. Moreover, high-wage women may leave demanding careers to care for their children (Elass, 2024).

In addition to correcting the returns to education for sample selection bias, we attempted to correct the returns to grade completion for selection into employment. However, the results for both women and men show the absence of selection bias (see Tables A.8 and A.9). Hence, no further analysis was conducted.

4.4 Discussion

Although we generally find that average returns to education amongst the younger (CSL-exposed) cohort are lower, the returns to an additional year of education (or for completing grade 9, which was directly targeted through the CSL) are estimated to be larger for the same exposed cohort. Depending on whether we look at average returns or returns at particular parts of the earnings distribution, or whether we account for selection into employment, the overall picture is that CSL treatment did not worsen returns for anyone considered in the analysis, and raised returns for at least some; therefore, the CSL offered benefits, at least on the margin, to the population it was meant to help.

It is difficult to determine whether returns increases are driven by signalling/screening or by productive education. The human capital theory assumes that additional education increases marginal productivity, and, therefore, leads to higher returns to schooling (Becker, 1962; Schultz, 1960). The signalling/screening assumes that additional education comes with a cost that is more easily borne by those that are more productive at

school activities, which provides information to the labour market about the individual's potential (Arrow et al., 1973; Spence, 1973; Stiglitz, 1975). Again, this model implies higher returns to education for those with more education. In South Africa, there are certainly concerns over the quality of education (Mlachila and Moeletsi, 2019; Spaull, 2015).⁹ On the other hand, not completing grade 9 within the context of a compulsory schooling law that pushes for grade 9 completion, provides information – that is very likely negative – to the labour market. Thus, we interpret the CSL-exposure \times education interaction results, especially for grade 9 completion, as more likely driven by signalling.

As described in Table 1, those exposed to compulsory education have more education; the one exception to that is tertiary education, which is likely the result of the younger ages of the exposed cohort. Thus, in keeping with both theories, the CSL-exposed have more education, and conditionally, ought to have greater returns. Our findings are similar to several other studies that find a positive relationship between compulsory schooling and completed years of education (Angrist and Keueger, 1991; Brunello et al., 2009; Clay et al., 2021; Korwatanasakul, 2023; Oyelere, 2010).

The non-corrected quantile regression overestimates the returns to education for females. The bias ranges from -0.9 and -4.4 percentage points; others have similarly found that the bias is small (Dougherty, 2005; Harmon et al., 2000). Controlling for selection into employment, however, does not alter the basic conclusion: (marginal or average) returns are constant neither across years of schooling nor across the distribution of earnings. The non-linear pattern of returns by level of education is consistent with the literature (Bronson et al., 2012; Mwabu and Schultz, 2000). The pattern can be attributed to increased demand for skilled workers (Bhorat, Goga and Stanwix, 2014), who are rewarded with higher wages than their lesser qualified counterparts. The results reinforce the idea of complementarity between education and ability in the sense that more able individuals tend to have higher returns to education than less able individuals (Fasih et al., 2012; Stefani and Biderman, 2009), suggesting that education is more beneficial to individuals with higher ability than those with low ability.

Not counting the CSL-exposure \times education (or grade 9) effect, returns to education, for the most part, increase from the bottom to the top of the distribution of earnings. Additionally, returns rise by level of education with tertiary education experiencing much

⁹In 2016, South African learners ranked last in reading scores in a sample of grade 4 learners from 50 countries participating in PIRLS. The Progress in International Reading Literacy Study (PIRLS) is an international assessment and research project designed to measure reading achievement at the fourth-grade level. Even though PIRLS consists of mostly advanced countries, South Africa still performs poorly among nations with comparable economic status. For example, South African learners are outperformed by their counterparts in Botswana, Swaziland (now Eswatini), Seychelles, Kenya and Mauritius in grade 6 reading and mathematics achievement, despite the fact that these countries spend less on education as a proportion of GDP and in per-student terms (Mlachila and Moeletsi, 2019).

higher returns than for lower levels of education. However, that pattern also implies that education increases wage inequality, since those at the top benefit more from education than those at the bottom of the distribution (Branson et al., 2012; Tansel and Bodur, 2012).

Furthermore, we estimate returns to education for women to be higher than for men, which is common in the literature (Dougherty, 2005; Rahman and Al-Hasan, 2018). In purely mechanical terms, due to the fact that base wages for women are lower than for men, the lower base is more amenable to larger percentage changes. In order for the amenable to occur, however, it is necessary for higher levels of education to allow women to overcome discrimination and be employed in high-paying traditionally male occupations (Dougherty, 2005).

Although returns are often increasing, at least through the middle of the distribution, they tend to decline at the 90th percentile, which could be due to earnings under-reporting for those at the top of the wage distribution. Both Seekings (2016) and Wittenberg (2017a) find that the South African earnings data are significantly lower in surveys than the reported earnings in tax assessments, especially at the top end of the earnings distribution. However, tax assessment data do not contain human capital variables and, as such, cannot be used for returns to education research.

5 Conclusion

South Africa introduced the compulsory schooling law in 1997, which compels young people of school-going age to be in school up until the last day of the school year in which they turn 15 or reach grade 9. However, the effectiveness of the reform is limited, due to the high repetition and dropout rates that characterise the education system in the country. Those drop-out rates are particularly high for those who have completed the compulsory schooling phase.

In this research, we investigate whether individuals subjected to mandatory schooling benefited, in terms of returns to schooling, compared to those not affected. We estimated returns for black African men and women, the majority of the population in South Africa, as well as the group that was disadvantaged under the apartheid regime and still experiences the highest rates of poverty and unemployment in the country.

Using conditional quantile regression, as well as an appropriate selection correction model, we estimated the corrected and uncorrected returns along the wage distribution, as well as at the mean. The focus on quantiles, rather than the mean, allows us to uncover

heterogeneities in returns across the wage distribution. The analysis is predicated on the 2018 South African General Household Survey.

Although several global studies have examined similar questions, this analysis is unique in several ways. First, it draws comparisons and contrasts between the education returns for individuals subjected to the mandatory schooling reform and those who were not. Second, it corrects for sample selection bias and estimates returns that are consistent. In a country like South Africa, where unemployment is rife, selection into employment might have had a large impact on the resulting estimates. Third, the most recent South African analysis was completed 27 years ago; thus, we offer a timely update; we also extend that analysis by examining returns for both men and women.

We find returns to each year of education, as well as the completion of grade 9 (which was specifically targeted by the CSL), to be higher, on average, as well as across multiple points of the wage distribution for individuals subjected to the CSL. Furthermore, we find returns from the 10th to the 50th percentiles of the wage distribution to generally be increasing, before dropping at the the 90th percentile. The results suggest that returns are non-linear both across the wage distribution and the years of schooling completed. Finally, not controlling for selection does yield upward biased estimates of returns; the effect of correcting that bias is highly dependent on the modelling assumptions.

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A Appendices

Table A.1: Derivation of years of education from highest education level

Highest education level	Code	Years of education
No schooling	98	0
Grade R/0	0	0
Grade 1/Sub A/Class 1	1	1
Grade 2/Sub B/Class 2	2	2
Grade 3/Standard 1/ABET/AET 1	3	3
Grade 4/Standard 2	4	4
Grade 5/Standard 3/ABET/AET 2	5	5
Grade 6/Standard 4	6	6
Grade 7/Standard 5/ABET/AET 3	7	7
Grade 8/Standard 6/Form 1	8	8
Grade 9/Standard 7/Form 2/ABET/AET 4/NCV Level 1 – NQF Level 1	9	9
Grade 10/Standard 8/Form 3/NCV Level 2 – NQF Level 2	10	10
Grade 11/Standard 9/Form 4/NCV Level 3 – NQF Level 3	11	11
NTC I/N1	13	9
NTC II/N2	14	10
NTC III/N3	15	11
Grade 12/Standard 10/Form 5/Matric/NCV Level 4 – NQF Level 4	12	12
N4/NTC 4 – NQF Level 5	16	13
N5/NTC 5 – NQF Level 5	17	13
N6/NTC 6 – NQF Level 5	18	13
Certificate with less than Grade 12/Standard 10	19	12
Diploma with less than Grade 12/Standard 10	20	13
Higher/National/Advance certificate with Grade 12/Std 10 – NQF Level 5	21	13
Diploma with Grade 12/Standard 10 – NQF Level 6	22	14
Higher Diploma/Occupational Certificate (B-Tech Diploma) – NQF Level 7	23	15
Bachelor's Degree/Occupational Certificate – NQF Level 7	25	15
Honours Degree/Postgraduate Diploma/Occupational Certificate – NQF Level 8	26	16
Post Higher Diploma (Master's Diploma and Master's Degree) – NQF Level 9	24	18
Doctoral Degrees (Doctoral Diploma and PhD) – NQF Level 10	27	21

Table A.2: Returns to education for women estimated via the quantile regression

	(1) OLS	(2) Q10	(3) Q25	(4) Q50	(5) Q75	(6) Q90
Education	0.139*** (0.004)	0.093*** (0.007)	0.145*** (0.007)	0.150*** (0.005)	0.143*** (0.005)	0.130*** (0.006)
CSL	-0.565** (0.237)	-1.427*** (0.321)	-0.701** (0.293)	-0.480* (0.253)	-1.064*** (0.282)	-0.293 (0.363)
CSL × Education	0.023** (0.011)	0.067*** (0.019)	0.025* (0.014)	0.026** (0.012)	0.034*** (0.013)	0.021 (0.013)
Age	0.010*** (0.003)	-0.005 (0.003)	0.007** (0.003)	0.016*** (0.003)	0.014*** (0.003)	0.015*** (0.003)
CSL × Age	0.010* (0.005)	0.023*** (0.007)	0.014** (0.006)	0.007 (0.006)	0.020*** (0.007)	0.003 (0.010)
Legally married	0.179*** (0.031)	0.152*** (0.045)	0.147*** (0.032)	0.198*** (0.036)	0.218*** (0.039)	0.093*** (0.034)
Eastern Cape	-0.543*** (0.063)	-0.808*** (0.082)	-0.677*** (0.058)	-0.506*** (0.061)	-0.373*** (0.099)	-0.309*** (0.073)
Northern Cape	-0.201** (0.093)	-0.626*** (0.132)	-0.275*** (0.080)	-0.141 (0.119)	0.011 (0.143)	0.008 (0.107)
Free State	-0.432*** (0.072)	-0.897*** (0.093)	-0.580*** (0.085)	-0.343*** (0.073)	-0.343*** (0.089)	-0.316*** (0.114)
KwaZulu-Natal	-0.366*** (0.060)	-0.635*** (0.084)	-0.413*** (0.055)	-0.279*** (0.058)	-0.230*** (0.079)	-0.206*** (0.069)
North West	-0.276*** (0.075)	-0.531*** (0.125)	-0.363*** (0.074)	-0.242*** (0.073)	-0.142 (0.102)	-0.220** (0.086)
Gauteng	0.041 (0.057)	-0.194** (0.077)	-0.059 (0.047)	0.049 (0.055)	0.077 (0.072)	0.045 (0.071)
Mpumalanga	-0.337*** (0.067)	-0.701*** (0.098)	-0.419*** (0.061)	-0.292*** (0.062)	-0.176* (0.092)	-0.190** (0.079)
Limpopo	-0.501*** (0.065)	-0.898*** (0.095)	-0.668*** (0.066)	-0.440*** (0.063)	-0.313*** (0.084)	-0.257*** (0.077)
Constant	6.623*** (0.149)	6.734*** (0.218)	6.142*** (0.199)	6.133*** (0.167)	6.960*** (0.173)	7.595*** (0.176)
Observations	6875	6875	6875	6875	6875	6875

Notes: In parentheses are bootstrapped standard errors. ***, **, and * indicate significance at the 1, 5, and 10% critical level. CSL = 1 if individual i was subjected to the compulsory schooling law (CSL), CSL = 0 otherwise.

Table A.3: Returns to education for men estimated via the quantile regression

	(1) OLS	(2) Q10	(3) Q25	(4) Q50	(5) Q75	(6) Q90
Education	0.101*** (0.005)	0.092*** (0.007)	0.103*** (0.007)	0.109*** (0.004)	0.108*** (0.004)	0.097*** (0.008)
CSL	-0.542*** (0.195)	-1.012*** (0.282)	-0.604*** (0.211)	-0.338* (0.205)	-0.584*** (0.210)	-0.174 (0.321)
CSL × Education	0.001 (0.008)	-0.006 (0.012)	-0.003 (0.010)	0.001 (0.009)	0.003 (0.008)	-0.001 (0.010)
Age	0.008*** (0.003)	-0.005 (0.003)	0.002 (0.003)	0.015*** (0.003)	0.012*** (0.003)	0.011** (0.005)
CSL × Age	0.016*** (0.005)	0.032*** (0.006)	0.018*** (0.005)	0.011** (0.005)	0.017*** (0.005)	0.004 (0.007)
Legally married	0.311*** (0.028)	0.341*** (0.040)	0.282*** (0.028)	0.323*** (0.030)	0.317*** (0.034)	0.206*** (0.050)
Eastern Cape	-0.630*** (0.057)	-0.917*** (0.076)	-0.690*** (0.064)	-0.500*** (0.055)	-0.552*** (0.069)	-0.552*** (0.099)
Northern Cape	-0.245*** (0.079)	-0.603*** (0.122)	-0.225** (0.093)	-0.086 (0.095)	-0.047 (0.086)	-0.319*** (0.083)
Free State	-0.445*** (0.066)	-0.625*** (0.089)	-0.436*** (0.066)	-0.263*** (0.066)	-0.467*** (0.076)	-0.424*** (0.094)
KwaZulu-Natal	-0.381*** (0.051)	-0.511*** (0.072)	-0.310*** (0.046)	-0.244*** (0.047)	-0.400*** (0.063)	-0.408*** (0.070)
North West	-0.209*** (0.062)	-0.305*** (0.093)	-0.177*** (0.056)	-0.037 (0.063)	-0.198*** (0.068)	-0.259*** (0.076)
Gauteng	-0.027 (0.048)	-0.086 (0.057)	0.011 (0.039)	0.030 (0.042)	-0.122* (0.057)	-0.107* (0.065)
Mpumalanga	-0.230*** (0.058)	-0.323*** (0.077)	-0.197*** (0.051)	-0.130** (0.052)	-0.293*** (0.061)	-0.342*** (0.088)
Limpopo	-0.507*** (0.055)	-0.743*** (0.090)	-0.497*** (0.060)	-0.372*** (0.051)	-0.495*** (0.075)	-0.471*** (0.075)
Constant	7.370*** (0.144)	6.978*** (0.196)	6.975*** (0.162)	6.851*** (0.150)	7.721*** (0.147)	8.503*** (0.270)
Observations	8006	8006	8006	8006	8006	8006

Notes: In parentheses are bootstrapped standard errors. ***, **, and * indicate significance at the 1, 5, and 10% critical level. CSL = 1 if individual i was subjected to the compulsory schooling law, CSL = 0 otherwise.

Table A.4: Returns to grade completion for women estimated via the quantile regression

	(1) OLS	(2) Q10	(3) Q25	(4) Q50	(5) Q75	(6) Q90
Grade 8	0.197** (0.077)	0.074 (0.089)	0.138 (0.093)	0.206** (0.084)	0.265*** (0.099)	0.340* (0.180)
Grade 9	0.206*** (0.070)	0.206*** (0.074)	0.243** (0.095)	0.199*** (0.073)	0.084 (0.070)	0.249** (0.123)
Grade 10	0.480*** (0.055)	0.258*** (0.068)	0.585*** (0.067)	0.468*** (0.060)	0.549*** (0.064)	0.552*** (0.106)
Grade 11	0.520*** (0.049)	0.322*** (0.066)	0.630*** (0.056)	0.532*** (0.056)	0.510*** (0.061)	0.527*** (0.092)
Grade 12	0.875*** (0.045)	0.694*** (0.058)	0.921*** (0.048)	0.843*** (0.055)	0.975*** (0.049)	0.881*** (0.083)
Tertiary	1.698*** (0.049)	1.325*** (0.079)	1.793*** (0.062)	1.961*** (0.056)	1.871*** (0.044)	1.492*** (0.082)
CSL	-0.467** (0.184)	-0.776*** (0.257)	-0.426** (0.201)	-0.310* (0.185)	-0.473** (0.226)	-0.262 (0.371)
CSL × Grade 9	0.021 (0.035)	-0.030 (0.043)	-0.009 (0.046)	0.054* (0.031)	0.075* (0.045)	-0.050 (0.085)
Age	0.005** (0.003)	-0.004 (0.004)	0.003 (0.003)	0.009*** (0.003)	0.010*** (0.003)	0.010*** (0.003)
CSL × Age	0.013** (0.005)	0.026*** (0.007)	0.013** (0.006)	0.009* (0.005)	0.013* (0.007)	0.009 (0.011)
Legally married	0.125*** (0.030)	0.097** (0.044)	0.143*** (0.033)	0.118*** (0.031)	0.118*** (0.033)	0.094** (0.039)
Eastern Cape	-0.565*** (0.064)	-0.716*** (0.086)	-0.702*** (0.060)	-0.542*** (0.062)	-0.385*** (0.072)	-0.414*** (0.092)
Northern Cape	-0.260*** (0.092)	-0.533*** (0.130)	-0.336*** (0.113)	-0.178* (0.105)	-0.102 (0.093)	-0.043 (0.112)
Free State	-0.436*** (0.071)	-0.777*** (0.103)	-0.537*** (0.094)	-0.362*** (0.061)	-0.363*** (0.083)	-0.365*** (0.100)
KwaZulu-Natal	-0.416*** (0.061)	-0.661*** (0.089)	-0.472*** (0.056)	-0.335*** (0.052)	-0.258*** (0.066)	-0.289*** (0.086)
North West	-0.314*** (0.074)	-0.547*** (0.144)	-0.395*** (0.070)	-0.257*** (0.061)	-0.199*** (0.077)	-0.244** (0.102)
Gauteng	-0.025 (0.057)	-0.191** (0.080)	-0.090* (0.050)	-0.026 (0.049)	0.065 (0.062)	0.027 (0.089)
Mpumalanga	-0.409*** (0.067)	-0.719*** (0.126)	-0.480*** (0.062)	-0.297*** (0.059)	-0.301*** (0.070)	-0.271*** (0.101)
Limpopo	-0.553*** (0.065)	-0.844*** (0.095)	-0.711*** (0.066)	-0.430*** (0.059)	-0.384*** (0.070)	-0.412*** (0.097)
Constant	7.640*** (0.143)	7.177*** (0.214)	7.117*** (0.157)	7.359*** (0.161)	7.822*** (0.143)	8.516*** (0.200)
Observations	6875	6875	6875	6875	6875	6875

Notes: In parentheses are bootstrapped standard errors. ***, **, and * indicate significance at the 1, 5, and 10% critical level. CSL = 1 if individual i was subjected to the compulsory schooling law, CSL = 0 otherwise.

Table A.5: Returns to grade completion for men estimated via the quantile regression

	(1) OLS	(2) Q10	(3) Q25	(4) Q50	(5) Q75	(6) Q90
Grade 8	0.138** (0.056)	0.153 (0.109)	0.113 (0.077)	0.142*** (0.054)	0.140** (0.068)	0.120 (0.090)
Grade 9	0.178*** (0.069)	0.219** (0.087)	0.129 (0.101)	0.135* (0.075)	0.205* (0.124)	0.293*** (0.096)
Grade 10	0.315*** (0.048)	0.352*** (0.093)	0.354*** (0.057)	0.336*** (0.044)	0.303*** (0.055)	0.285*** (0.068)
Grade 11	0.352*** (0.041)	0.520*** (0.072)	0.450*** (0.054)	0.389*** (0.041)	0.297*** (0.047)	0.206*** (0.065)
Grade 12	0.604*** (0.039)	0.682*** (0.060)	0.660*** (0.049)	0.659*** (0.040)	0.621*** (0.041)	0.532*** (0.054)
Tertiary	1.265*** (0.048)	1.135*** (0.076)	1.236*** (0.067)	1.446*** (0.045)	1.376*** (0.047)	1.240 (0.063)
CSL	-0.639*** (0.163)	-1.186*** (0.283)	-0.928*** (0.206)	-0.585*** (0.147)	-0.391** (0.188)	0.002 (0.265)
CSL times Grade 9	0.024 (0.029)	0.094** (0.039)	0.082** (0.038)	0.050* (0.028)	-0.014 (0.047)	-0.056 (0.038)
Age	0.005* (0.002)	-0.007 (0.005)	-0.002 (0.003)	0.007*** (0.002)	0.011*** (0.002)	0.011*** (0.004)
CSL times Age	0.019*** (0.005)	0.034*** (0.008)	0.025*** (0.006)	0.017*** (0.004)	0.013** (0.005)	0.001 (0.007)
Legally married	0.283*** (0.027)	0.345*** (0.045)	0.281*** (0.029)	0.318*** (0.028)	0.280*** (0.034)	0.231*** (0.042)
Eastern Cape	-0.630*** (0.057)	-0.776*** (0.087)	-0.672*** (0.073)	-0.565*** (0.058)	-0.615*** (0.065)	-0.638*** (0.081)
Northern Cape	-0.286*** (0.077)	-0.396*** (0.135)	-0.251*** (0.090)	-0.225*** (0.068)	-0.084 (0.101)	-0.305*** (0.080)
Free State	-0.436*** (0.066)	-0.536*** (0.149)	-0.385*** (0.082)	-0.368*** (0.064)	-0.479*** (0.075)	-0.422*** (0.101)
KwaZulu-Natal	-0.404*** (0.051)	-0.434*** (0.083)	-0.325*** (0.046)	-0.337*** (0.049)	-0.465*** (0.065)	-0.505*** (0.072)
North West	-0.223*** (0.062)	-0.266** (0.123)	-0.198*** (0.076)	-0.114 (0.072)	-0.193*** (0.072)	-0.285*** (0.078)
Gauteng	-0.057 (0.048)	-0.009 (0.076)	0.013 (0.042)	-0.047 (0.046)	-0.182*** (0.059)	-0.166** (0.070)
Mpumalanga	-0.254*** (0.058)	-0.293*** (0.099)	-0.173*** (0.053)	-0.236*** (0.055)	-0.304*** (0.068)	-0.420*** (0.076)
Limpopo	-0.519*** (0.055)	-0.619*** (0.085)	-0.484*** (0.071)	-0.444*** (0.052)	-0.587*** (0.065)	-0.542*** (0.085)
Constant	8.108*** (0.129)	7.413*** (0.238)	7.764*** (0.156)	7.876*** (0.122)	8.401*** (0.131)	9.056*** (0.203)
Observations	8006	8006	8006	8006	8006	8006

Notes: All equations include survey year as an additional control variable. Standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10% critical level. CSL = 1 if individual i was subjected to the compulsory schooling law, CSL = 0 otherwise.

Table A.6: Returns to education for women estimated via the quantile selection model

	Mean		Quantile Selection Model					
	Probit	Heckman	Probit	Q10	Q25	Q50	Q75	Q90
Education	0.048*** (0.006)	0.126*** (0.005)	0.048*** (0.005)	0.094*** (0.007)	0.133*** (0.009)	0.141*** (0.007)	0.138*** (0.007)	0.115*** (0.011)
CSL	-0.848*** (0.253)	0.149 (0.300)	-0.848*** (0.248)	-1.003*** (0.376)	-0.240 (0.364)	-0.097 (0.384)	0.172 (0.681)	0.683 (0.616)
CSL × Education	0.022** (0.011)	0.012 (0.010)	0.022** (0.010)	0.057*** (0.020)	0.017 (0.014)	0.019 (0.012)	0.018 (0.018)	-0.008 (0.021)
Age	0.046*** (0.003)	0.002 (0.004)	0.046*** (0.003)	-0.008* (0.004)	0.002 (0.004)	0.007 (0.005)	0.006 (0.006)	0.006 (0.007)
CSL × Age	0.021*** (0.006)	-0.007 (0.007)	0.021*** (0.006)	0.014* (0.008)	0.003 (0.008)	-0.003 (0.009)	-0.012 (0.016)	-0.014 (0.013)
Legally married	0.098*** (0.035)	0.145*** (0.030)	0.098*** (0.036)	0.130*** (0.042)	0.088** (0.043)	0.210*** (0.045)	0.146*** (0.052)	0.088 (0.059)
Eastern Cape	-0.011 (0.073)	-0.518*** (0.064)	-0.011 (0.074)	-0.839*** (0.067)	-0.643*** (0.056)	-0.485*** (0.080)	-0.350*** (0.104)	-0.147 (0.140)
Northern Cape	-0.099 (0.101)	-0.128 (0.091)	-0.099 (0.102)	-0.572*** (0.141)	-0.269*** (0.076)	-0.006 (0.146)	0.091 (0.138)	0.036 (0.158)
Free State	-0.242*** (0.080)	-0.367*** (0.076)	-0.242*** (0.081)	-0.857*** (0.101)	-0.437*** (0.100)	-0.232** (0.106)	-0.287*** (0.107)	-0.140 (0.157)
KwaZulu-Natal	-0.145** (0.067)	-0.266*** (0.062)	-0.145** (0.068)	-0.586*** (0.082)	-0.330*** (0.067)	-0.167* (0.091)	-0.120 (0.093)	-0.061 (0.148)
North West	-0.122 (0.083)	-0.207*** (0.076)	-0.122 (0.084)	-0.544*** (0.099)	-0.247*** (0.090)	-0.147 (0.113)	-0.186* (0.103)	-0.076 (0.166)
Gauteng	-0.130** (0.064)	0.077 (0.058)	-0.130** (0.065)	-0.170*** (0.063)	-0.009 (0.043)	0.171** (0.087)	0.083 (0.081)	0.261 (0.194)
Mpumalanga	-0.238*** (0.072)	-0.219*** (0.070)	-0.238*** (0.074)	-0.630*** (0.095)	-0.311*** (0.072)	-0.166* (0.100)	-0.071 (0.095)	-0.007 (0.189)
Limpopo	0.159** (0.076)	-0.504*** (0.066)	0.159** (0.077)	-0.872*** (0.082)	-0.624*** (0.059)	-0.388*** (0.082)	-0.334*** (0.099)	-0.187 (0.121)
Children under 6	-0.161*** (0.017)		-0.161*** (0.017)					
Constant	-1.534*** (0.197)	7.278*** (0.270)	-1.534*** (0.190)	6.977*** (0.251)	6.557*** (0.266)	6.719*** (0.355)	7.570*** (0.400)	8.225*** (0.485)
$G_x(\rho)$	-0.634*** (0.187)		0.494** (0.236)					
Observations	9901	9901	9901	9901	9901	9901	9901	9901

Notes: All equations include survey year as an additional control variable. Standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10% critical level. CSL = 1 if individual i was subjected to the compulsory schooling law, CSL = 0 otherwise.

Table A.7: Returns to education for men estimated via the quantile selection model

	Mean		Quantile Selection Model					
	Probit	Heckman	Probit	Q10	Q25	Q50	Q75	Q90
Education	0.019*** (0.006)	0.100*** (0.004)	0.019*** (0.006)	0.091*** (0.009)	0.101*** (0.008)	0.107*** (0.005)	0.104*** (0.005)	0.091*** (0.008)
CSL	-2.209*** (0.237)	-0.322 (0.333)	-2.209*** (0.228)	-0.827 (0.527)	-0.375 (0.458)	-0.137 (0.447)	-0.367 (0.701)	0.061 (0.633)
CSL × Education	-0.000 (0.010)	0.001 (0.007)	-0.000 (0.009)	-0.006 (0.012)	-0.001 (0.010)	0.004 (0.008)	0.007 (0.012)	-0.003 (0.011)
Age	0.005 (0.003)	0.007*** (0.002)	0.005 (0.003)	-0.006 (0.004)	0.003 (0.003)	0.015*** (0.003)	0.010*** (0.003)	0.008 (0.005)
CSL × Age	0.063*** (0.005)	0.010 (0.009)	0.063*** (0.005)	0.025* (0.015)	0.010 (0.013)	0.004 (0.012)	0.009 (0.018)	-0.003 (0.017)
Legally married	0.674*** (0.041)	0.284*** (0.057)	0.674*** (0.040)	0.297*** (0.069)	0.235*** (0.065)	0.275*** (0.071)	0.247** (0.102)	0.157 (0.114)
Eastern Cape	-0.324*** (0.077)	-0.608*** (0.063)	-0.324*** (0.078)	-0.904*** (0.095)	-0.624*** (0.096)	-0.447*** (0.079)	-0.519*** (0.096)	-0.425*** (0.155)
Northern Cape	-0.284*** (0.103)	-0.180** (0.082)	-0.284*** (0.104)	-0.538*** (0.176)	-0.200* (0.117)	0.047 (0.139)	0.001 (0.102)	-0.251 (0.170)
Free State	-0.381*** (0.085)	-0.401*** (0.072)	-0.381*** (0.086)	-0.619*** (0.119)	-0.357*** (0.099)	-0.207** (0.088)	-0.387*** (0.100)	-0.363*** (0.136)
KwaZulu-Natal	-0.305*** (0.071)	-0.346*** (0.059)	-0.305*** (0.072)	-0.475*** (0.096)	-0.279*** (0.062)	-0.212*** (0.067)	-0.376*** (0.103)	-0.327*** (0.101)
North West	-0.228*** (0.083)	-0.171*** (0.063)	-0.228*** (0.084)	-0.299*** (0.112)	-0.111 (0.078)	-0.011 (0.096)	-0.147* (0.079)	-0.223** (0.120)
Gauteng	-0.209*** (0.069)	-0.027 (0.051)	-0.209*** (0.069)	-0.089 (0.073)	0.035 (0.048)	0.064 (0.058)	-0.099 (0.080)	-0.013 (0.114)
Mpumalanga	-0.358*** (0.077)	-0.211*** (0.065)	-0.358*** (0.078)	-0.328*** (0.094)	-0.146** (0.074)	-0.112 (0.079)	-0.248*** (0.087)	-0.220 (0.152)
Limpopo	0.031 (0.081)	-0.500*** (0.055)	0.031 (0.083)	-0.728*** (0.100)	-0.461*** (0.065)	-0.367*** (0.056)	-0.475*** (0.083)	-0.443*** (0.095)
Children under 6	-0.135*** (0.019)		-0.135*** (0.019)					
Constant	0.680*** (0.196)	7.465*** (0.156)	0.680*** (0.186)	7.110*** (0.263)	7.024*** (0.169)	6.899*** (0.149)	7.905*** (0.240)	8.736*** (0.345)
$G_x(\rho)$	-0.201 (0.230)		0.262 (0.319)					
Observations	10639	10639	10639	10639	10639	10639	10639	10639

Notes: All equations include survey year as an additional control variable. Standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10% critical level. CSL = 1 if individual i was subjected to the compulsory schooling law, CSL = 0 otherwise.

Table A.8: Returns to grade completion for women estimated via the quantile selection models

	Mean		Quantile Selection Model					
	Probit	Heckman	Probit	Q10	Q25	Q50	Q75	Q90
Grade 8	-0.043 (0.082)	0.188*** (0.066)	-0.043 (0.084)	0.011 (0.110)	0.137 (0.089)	0.174** (0.085)	0.246* (0.138)	0.277* (0.151)
Grade 9	-0.175** (0.089)	0.208*** (0.072)	-0.175* (0.090)	0.240*** (0.087)	0.231** (0.116)	0.223*** (0.073)	0.106 (0.134)	0.247* (0.147)
Grade 10	-0.025 (0.061)	0.492*** (0.050)	-0.025 (0.061)	0.288*** (0.071)	0.592*** (0.095)	0.494*** (0.065)	0.512*** (0.078)	0.563*** (0.124)
Grade 11	0.015 (0.057)	0.518*** (0.047)	0.015 (0.057)	0.334*** (0.099)	0.628*** (0.066)	0.553*** (0.066)	0.483*** (0.081)	0.508*** (0.114)
Grade 12	0.208*** (0.052)	0.861*** (0.043)	0.208*** (0.053)	0.697*** (0.068)	0.941*** (0.054)	0.869*** (0.067)	0.958*** (0.066)	0.904*** (0.124)
Tertiary	0.736*** (0.064)	1.699*** (0.063)	0.736*** (0.063)	1.358*** (0.114)	1.799*** (0.076)	2.009*** (0.097)	1.885*** (0.096)	1.543*** (0.177)
CSL	-0.777*** (0.205)	-0.328 (0.225)	-0.777*** (0.201)	-0.782** (0.379)	-0.541* (0.316)	-0.302 (0.224)	-0.529 (0.470)	-0.415 (0.568)
CSL × Grade 9	0.064* (0.039)	0.024 (0.037)	0.064 (0.039)	-0.020 (0.054)	-0.007 (0.052)	0.060 (0.053)	0.053 (0.062)	-0.049 (0.100)
Age	0.042*** (0.003)	0.005 (0.003)	0.042*** (0.003)	-0.002 (0.005)	0.005 (0.005)	0.012*** (0.005)	0.012*** (0.004)	0.013** (0.006)
CSL × Age	0.025*** (0.006)	0.010 (0.007)	0.025*** (0.006)	0.025** (0.011)	0.017* (0.009)	0.009 (0.007)	0.014 (0.013)	0.014 (0.017)
Legally married	0.070* (0.036)	0.117*** (0.027)	0.070* (0.036)	0.099** (0.049)	0.147*** (0.046)	0.116*** (0.036)	0.133*** (0.034)	0.114** (0.055)
Eastern Cape	-0.041 (0.074)	-0.552*** (0.059)	-0.041 (0.074)	-0.729*** (0.137)	-0.712*** (0.065)	-0.580*** (0.077)	-0.422*** (0.094)	-0.407*** (0.120)
Northern Cape	-0.148 (0.101)	-0.212** (0.085)	-0.148 (0.102)	-0.516*** (0.156)	-0.384*** (0.121)	-0.244** (0.123)	-0.149 (0.129)	-0.053 (0.155)
Free State	-0.266*** (0.080)	-0.427*** (0.071)	-0.266*** (0.081)	-0.759*** (0.132)	-0.548*** (0.117)	-0.383*** (0.079)	-0.411*** (0.115)	-0.367** (0.168)
KwaZulu-Natal	-0.192*** (0.068)	-0.370*** (0.058)	-0.192*** (0.068)	-0.659*** (0.131)	-0.505*** (0.092)	-0.347*** (0.063)	-0.308*** (0.092)	-0.267** (0.124)
North West	-0.162* (0.083)	-0.284*** (0.071)	-0.162* (0.084)	-0.625*** (0.179)	-0.402*** (0.085)	-0.264*** (0.065)	-0.229** (0.098)	-0.243* (0.129)
Gauteng	-0.175*** (0.065)	-0.012 (0.054)	-0.175*** (0.065)	-0.225* (0.119)	-0.111* (0.059)	-0.050 (0.074)	0.026 (0.082)	0.008 (0.120)
Mpumalanga	-0.287*** (0.073)	-0.360*** (0.066)	-0.287*** (0.074)	-0.732*** (0.172)	-0.496*** (0.096)	-0.335*** (0.081)	-0.364*** (0.099)	-0.294** (0.148)
Limpopo	0.115 (0.077)	-0.540*** (0.060)	0.115 (0.078)	-0.837*** (0.148)	-0.697*** (0.067)	-0.459*** (0.068)	-0.420*** (0.098)	-0.416*** (0.124)
Children under 6	-0.153*** (0.017)		-0.153*** (0.017)					
Constant	-0.942*** (0.184)	7.623*** (0.208)	-0.942*** (0.179)	7.055*** (0.352)	6.985*** (0.312)	7.206*** (0.331)	7.755*** (0.228)	8.325*** (0.445)
$G_x(\rho)$	-0.091 (0.166)		-0.128 (0.294)					
Observations	9901	9901	9901	9901	9901	9901	9901	9901

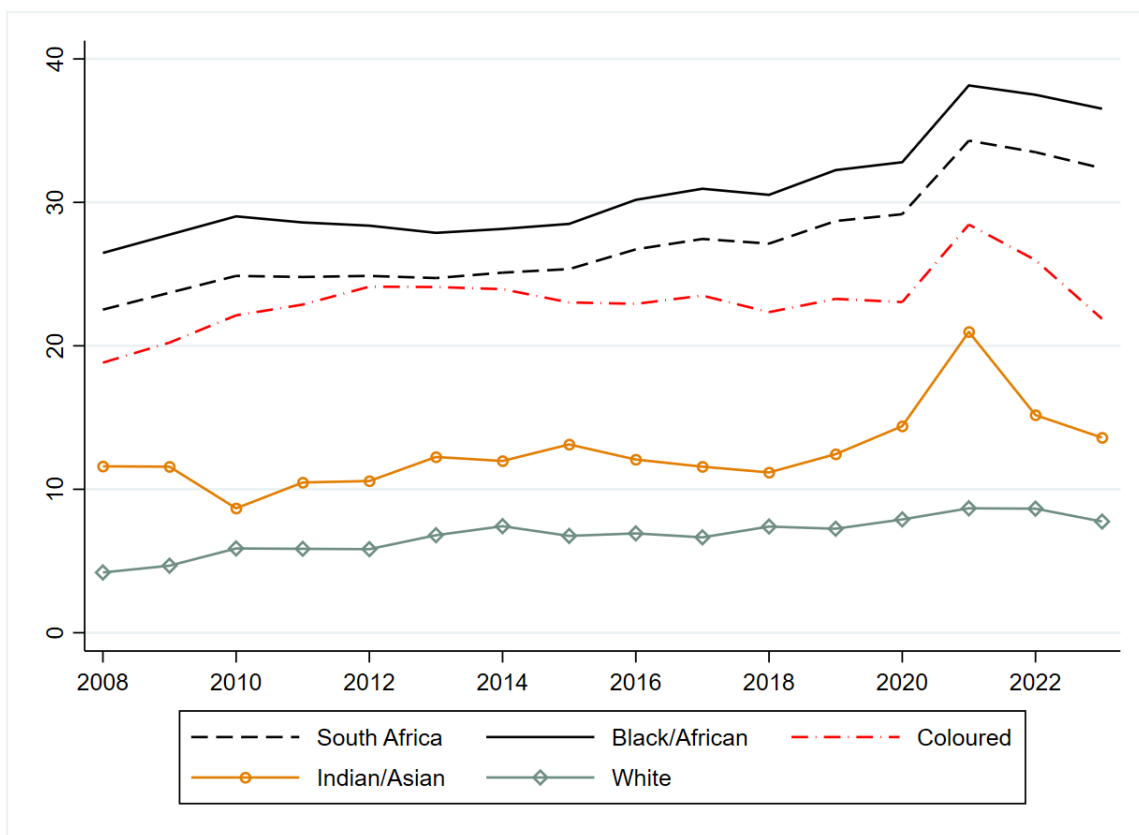
Notes: All equations include survey year as an additional control variable. Standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10% critical level. CSL = 1 if individual i was subjected to the compulsory schooling law, CSL = 0 otherwise.

Table A.9: Returns to grade completion for men estimated via the quantile selection models

	Mean		Quantile Selection Model					
	Probit	Heckman	Probit	Q10	Q25	Q50	Q75	Q90
Grade 8	-0.055 (0.071)	0.137** (0.055)	-0.055 (0.073)	0.117 (0.112)	0.111 (0.082)	0.158** (0.067)	0.177** (0.083)	0.092 (0.120)
Grade 9	-0.059 (0.093)	0.161** (0.066)	-0.059 (0.095)	0.260** (0.103)	0.163* (0.098)	0.158** (0.071)	0.225** (0.114)	0.294** (0.124)
Grade 10	-0.148*** (0.054)	0.326*** (0.045)	-0.148*** (0.055)	0.278** (0.127)	0.363*** (0.054)	0.329*** (0.049)	0.280*** (0.073)	0.290** (0.125)
Grade 11	0.003 (0.053)	0.376*** (0.040)	0.003 (0.053)	0.485*** (0.081)	0.438*** (0.048)	0.416*** (0.066)	0.307*** (0.063)	0.211** (0.097)
Grade 12	0.097** (0.047)	0.634*** (0.036)	0.097** (0.047)	0.640*** (0.077)	0.684*** (0.054)	0.666*** (0.047)	0.637*** (0.064)	0.544*** (0.073)
Tertiary	0.348*** (0.064)	1.315*** (0.049)	0.348*** (0.062)	1.106*** (0.095)	1.254*** (0.064)	1.466*** (0.064)	1.411*** (0.093)	1.281*** (0.094)
CSL	-2.290*** (0.199)	-0.728** (0.299)	-2.290*** (0.195)	-1.501** (0.703)	-1.230** (0.605)	-0.692 (0.447)	-0.535 (0.523)	-0.330 (0.593)
CSL × Grade 9	0.027 (0.037)	0.039 (0.029)	0.027 (0.037)	0.086 (0.060)	0.070* (0.038)	0.054 (0.041)	-0.013 (0.058)	-0.049 (0.059)
Age	0.003 (0.003)	0.003 (0.002)	0.003 (0.003)	-0.007 (0.005)	-0.003 (0.003)	0.008*** (0.002)	0.012*** (0.003)	0.011** (0.005)
CSL × Age	0.065*** (0.005)	0.021** (0.009)	0.065*** (0.005)	0.044** (0.021)	0.033* (0.017)	0.020 (0.013)	0.018 (0.015)	0.011 (0.017)
Legally married	0.661*** (0.041)	0.318*** (0.053)	0.661*** (0.040)	0.397*** (0.104)	0.322*** (0.088)	0.344*** (0.070)	0.320*** (0.096)	0.264** (0.131)
Eastern Cape	-0.328*** (0.077)	-0.646*** (0.061)	-0.328*** (0.078)	-0.812*** (0.100)	-0.725*** (0.118)	-0.578*** (0.091)	-0.646*** (0.100)	-0.661*** (0.173)
Northern Cape	-0.298*** (0.103)	-0.252*** (0.080)	-0.298*** (0.104)	-0.440*** (0.143)	-0.256** (0.119)	-0.201* (0.118)	-0.148 (0.139)	-0.314** (0.127)
Free State	-0.379*** (0.085)	-0.439*** (0.070)	-0.379*** (0.086)	-0.585*** (0.166)	-0.481*** (0.146)	-0.384*** (0.106)	-0.511*** (0.123)	-0.460*** (0.162)
KwaZulu-Natal	-0.317*** (0.072)	-0.407*** (0.058)	-0.317*** (0.072)	-0.465*** (0.102)	-0.340*** (0.066)	-0.347*** (0.071)	-0.510*** (0.113)	-0.510*** (0.130)
North West	-0.229*** (0.083)	-0.208*** (0.061)	-0.229*** (0.084)	-0.359** (0.151)	-0.241** (0.099)	-0.111 (0.095)	-0.234** (0.099)	-0.270** (0.109)
Gauteng	-0.220*** (0.069)	-0.071 (0.050)	-0.220*** (0.069)	-0.038 (0.093)	-0.006 (0.058)	-0.044 (0.061)	-0.205** (0.095)	-0.194 (0.126)
Mpumalanga	-0.361*** (0.077)	-0.281*** (0.064)	-0.361*** (0.078)	-0.347*** (0.119)	-0.215*** (0.082)	-0.248*** (0.074)	-0.333*** (0.096)	-0.443*** (0.154)
Limpopo	0.024 (0.081)	-0.520*** (0.054)	0.024 (0.083)	-0.646*** (0.097)	-0.490*** (0.084)	-0.430*** (0.063)	-0.589*** (0.088)	-0.540*** (0.102)
Children under 6	-0.130*** (0.020)		-0.130*** (0.019)					
Constant	0.912*** (0.178)	8.105*** (0.136)	0.912*** (0.171)	7.390*** (0.247)	7.762*** (0.149)	7.786*** (0.156)	8.311*** (0.221)	9.019*** (0.253)
$G_x(\rho)$	0.057 (0.215)		-0.194 (0.399)					
Observations	10639	10639	10639	10639	10639	10639	10639	10639

Notes: All equations include survey year as an additional control variable. Standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10% critical level. CSL = 1 if individual i was subjected to the compulsory schooling law, CSL = 0 otherwise.

Figure A.1: Unemployment rate (%) in South Africa by population group



Source: Author's calculations based on the 2022 Census data.