

Minimum Wages in a Segmented Labor Market: Evidence from South Africa

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Abstract

The segmented labor market model describes the impacts of minimum wages on covered and uncovered sectors. This paper examines the impacts an industry-specific minimum wage in South Africa. Formal agricultural and household workers are covered by the law, while informal workers and other sectors are not. The unique aspect of this paper lies in the ability to compare the impacts of minimum wage legislation on formal covered, informal covered, formal uncovered, and informal uncovered. We find high paid workers are unaffected, covered formal have higher pay and less employment, uncovered and informal low paid workers experience pay and employment increases.

Keywords: minimum wage, South African labor markets, covered and uncovered sectors.

MINIMUM WAGES IN A SEGMENTED LABOR MARKET: Evidence from South Africa

The 1994 election of the African National Congress (ANC) marked a significant shift in the South African policy environment. The shift has been particularly evident in labor policies where changes have been instituted to reverse the impacts of the Apartheid system, which had resulted in significant differences in education, training, and employment opportunities for people of different races. The South African labor market is still characterized by significant racial disparities, high unemployment rates, and active government intervention. As an example of such involvement, the Ministry of Labour explicitly addresses conditions of employment by requiring formal arrangements between workers and employers. In some cases, terms of employment are established through collective bargaining agreements; in other cases, effective minimum wages are established. This paper addresses the latter, examining the impacts of minimum wage policies in South Africa for different segments of the population.

The effects of minimum wage legislation on the level and distribution of wages and employment has been examined by many researchers. The traditional competitive labor market model predicts that a wage floor will drive up the wages of those workers earning at or near the minimum wage but will create some unemployment. Hence, minimum wage legislation will create winners and losers. The net value of the policy depends on the gains accruing to those workers who retain their jobs relative to the losses in earnings of those who lose their jobs. Empirical evidence of pay generally finds that minimum wages do indeed compress the wage distribution, affecting the lower tail of the wage distribution more than the upper tail (Brown 1999). The evidence is mixed regarding the effects on employment, however.

Another theory posits that the labor market is segmented into dual markets, where opportunities and pay differ systematically across various sectors of the economy. A dual

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market may be segmented between formal and informal sectors, workers covered by labor policies and those left uncovered, or even along racial or gender lines (Lewis 1954; Harris and Todaro 1970). The two-sector model is particularly applicable in analyzing minimum wages for countries with less developed institutional enforcement structures (Jones 1997; Borat et al. 2010). Under the two-sector model, a minimum wage leads to a rise in wages in the formal sector, but a decline in pay in the informal sector as displaced workers from the formal sector crowd into the informal sector. It follows that employment is expected to increase in the informal sector and fall in the formal sector. However, if workers in the informal sector are effective substitutes for workers in the formal sector, firms may opt to hire informal sector workers rather than the more expensive formal sector workers which would bid up the price of informal workers. Thus there could be a positive spillover effect from the minimum wage on pay in the informal sector.

A similar scenario could apply to covered and uncovered workers if minimum wages are not universally applied, as is the case in South Africa. The Labour Ministry's Basic Conditions of Employment Act of 2002 established minimum wages only in certain *covered* sectors, namely, the agricultural and household sectors. Pay is expected to increase and employment to decrease in these newly covered industries; however, pay for other, *uncovered*, workers may increase or decrease depending on relative magnitudes of the crowding in and spillover pay effects. Employment in the uncovered sectors is expected to increase.

Studies of the U.S. minimum wage have found mixed results. Several researchers found that the disemployment effects of the minimum wage outweigh the associated wage gains (Stigler 1946; Partridge and Partridge 1999; Neumark and Wascher 2000). In contrast, others found that the pay benefits of minimum wage legislation exceed the employment costs

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(Gramlich 1976; Mincy 1990; DiNardo et al. 1996; Addison and Blackburn 1999; Allegretto et al. 2011). In fact, some researchers have theorized that the implementation of a minimum wage may not have disemployment effects. If the wage increase is accompanied by an increase in productivity, then employment would not fall and could actually increase as found by Card (1992), Katz and Krueger (1992), and Card and Krueger (1994, 1995, 2000). Similarly, Machin et al. (2003) and Machin and Wilson (2004) found that a national minimum wage, introduced in the U.K. in 1999, compressed wages in the lower tail of the distribution, but had relatively small disemployment effects. Dickens and Manning (2004) confirmed the increased earnings.

It is also important to note that minimum wage impacts are likely not equally distributed across the economy. For instance, Moore (1971) indicated that minorities and females in the U.S. were more adversely impacted by an increase in the minimum wage compared to white males. Neumark and Wascher (2002) and Neumark et al. (2004, 2005) found that the impacts of minimum wage legislation was confined to redistribution of income among low-income families. Leigh (2007) confirmed these results for Australia. Such distributional impacts are important to investigate in a country with strong racial and socioeconomic divisions like South Africa.

All the studies previously cited focused on minimum wage policies in developed economies; however, several researchers have found the effects of minimum wage legislation to be magnified in developing countries (Castillo Freeman and Freeman 1992; Neumark et al. 2006). Lemos (2009) finds that minimum wages compressed pay in both the formal and the informal sectors in Brazil. She also found that pay norms were increased for both covered and uncovered workers but there were no impacts on hours worked or number of jobs. Additional studies (Lemos, 2003 and 2004) confirmed these findings. Also reinforcing these results, Neumark et al. (2006) examined major metropolitan areas in Brazil from 1996 to 2001 and found

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that an increase in the minimum wage drove up the wages of low-wage workers, but had little impact on the wages of high-wage workers. However, the authors also discovered a significant disemployment effect associated with the increased minimum wage, which reduced the incomes of families in the lower tail of the income distribution.

Bell (1997) found that a change in the minimum wage had no impact on pay and employment in Mexico. In contrast, Fairris et al. (2008) found that the minimum wage served as a guide for pay across the Mexican economy, but noted that the impacts of changes were not evenly distributed. Studying Colombia, Angel-Urdinola (2008) concluded that the disemployment effects of minimum wage laws outweighed the gain in earnings, resulting in increased income inequality. Bell (1997) also found significant disemployment impacts from minimum wages, accompanied by wage compression in Colombia. Similar results were found by Maloney and Mendez (2004) for Columbia; Castillo-Freeman and Freeman (1992) for Puerto Rico; Rama (2001) and Bird and Manning (2008) for Indonesia; Cowan et al. (2004) and Montenegro and Pagés (2004) for Chile; and Gindling and Terrell (2004) for Costa Rica.

Alaniz et al. (2011) found that changes in the minimum wage in Nicaragua only effected workers whose initial wage were close to the minimum, both in terms of higher pay and less employment. Jones (1997) found a similar result for Ghana, while Andalón and Pagés (2008) found that different sectors reacted differently to minimum wages in Kenya. In particular they found that the non-agricultural sectors had higher compliance rates and that employment fell in the formal sectors. While agricultural workers were not impacted, women and low-wage workers experienced positive pay changes.

Consistently researchers have found that effective minimum wages have positive wage impacts for low paid workers in the formal covered sector; however, the pay impacts for other

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workers vary both theoretically and empirically. Workers may crowd into other sectors driving pay down and employment up or better pay may spill over into the other sectors as employers substitute toward hiring workers from these uncovered sectors.

Labor markets can be segmented based on formal and informal sectors, on job attributes, or differences in workers, often along racial or gender lines. In South Africa, labor market segmentation may be more distinct than in other labor markets due, in large part, to the years it was under the Apartheid system of racial segregation. From 1948 until the first universal suffrage in 1994, the Apartheid system institutionalized differences in education, training, and employment opportunities by race. Under the leadership of the ANC, South Africa adopted a new constitution and implemented a series of labor regulations intended to address discrimination in hiring, training, and promotion.¹ The South African labor market still is characterized, in part, by racial segregation, high unemployment, strong labor unions in certain sectors, and vulnerable workers in other sectors. These labor market conditions contribute to a robust informal sector (Kingdon and Knight, 2004).

Within certain industrial sectors, such as mining, manufacturing, trade workers, and highly skilled professionals and technicians, unions are relatively strong and pay is largely determined by collective bargaining agreements. In other sectors characterized by low-pay and non-unionized workers, namely the household and agricultural sectors, the Labour Ministry established minimum wages in the Basic Conditions of Employment Act 2002. Bhorat (2000) predicted that minimum wage legislation in South Africa would lead to a decline in employment among low-wage household and farm workers. Hertz (2004) confirmed a disemployment effect

¹ The new Constitution of 1996, established a founding value to be non-racialism and non-sexism. In addition the Employment Equity Act (1998) implemented affirmative action and the Skills Development Act (1998) encouraged human capital investment both in the form of education and training. The Broad Based Black Economic Empowerment (2003) developed a system of labor force assessments called the “Codes of Good Practice” to incentivize “meaningful participation of black people in the economy.”

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in terms of a decrease in hours worked, but also found higher real earnings per capita for household workers. However, Dinkelman and Ranchhod (2010) found no evidence of disemployment effects associated with minimum wages in South Africa.

In this study, we examine the impacts of the minimum wage legislation by analyzing pay and employment before and after its implementation across the formal and informal sectors of various industries. We find that the introduction of minimum wage legislation coincided with increased pay for black and colored² workers in the agricultural and household sectors both in formal and informal markets. Such increases in pay were less pronounced for black and colored workers in other unaffected sectors or for white workers in general. We also find considerable evidence of disemployment effects among black female workers, and to a lesser extent among black males. There is little evidence of any direct disemployment affects for white males or females.

Data

Data for this study were gathered from the semi-annual Labour Force Survey (LFS) produced each March and September between 2000 and 2007 by Statistics South Africa.³ The survey includes similar questions each year, but the respondents are not tracked from year to year. Across the eight years of data, there are a total of 116,019 respondents in our sample. Over three quarters of the sample were black, 18.0% were colored, and 6.4% were white. In every race classification, over half of the workers were male.

² In South Africa, the racial designation *coloured* (or colored) refers to individuals having both African and white ancestry. Individuals of Asian descent are also an officially recognized population group. However, small sample sizes precluded an analysis of these workers.

³ The predecessor to the LFS was the October Household Survey, which was conducted annually from 1995 to 1999. In 2008, Statistics South Africa began producing the Quarterly Labour Force Survey. However, neither of these publications is strictly comparable with the LFS, therefore we restrict our analysis to the surveys conducted between 2000 and 2007. To eliminate possible seasonal variation we simply use the September surveys.

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Pay in Table 1 is reported as the log of hourly pay. When pay was converted to an annual equivalence, the real average annual income of the sample was R25,703 (in 2000 Rand), or approximately \$3,500.⁴ Average income was highly dependent on sex and race, however. White males earned about three times the income of black males during the period, while black males earned about fifty percent more than black females. There was also a wide wage gap between formal and informal sector workers. On average, formal sector workers earned about three times the annual income of those in the informal sector.

-----Insert Table 1 Here-----

Disparities across population groups are also apparent in terms of human capital. White males and females averaged over 12 years of education, while black and colored males and females completed an average of between 7 and 8 years of schooling. Within population groups, females generally exhibited slightly higher educational attainment, which may reflect either lower opportunity costs to education, higher expected returns to education or some combination of both these explanations.

Over 80% of the black and colored males were employed in the formal sector, while 60% of black females and 72% of colored females were formally employed. For whites, both male and female, nearly all workers were in the formal sector (97.3% and 96.1%, respectively). Rates of unionism, however, were fairly consistent across the different groups of workers with approximately one-quarter to one-third of the workers belonging to a union.

⁴ The real annual average pay estimate given here was computed as reported hourly pay multiplied by the hours the respondent normally works times fifty weeks per year.

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Table 1 also provides evidence of occupational segregation; both black and colored males were concentrated in craft/trade, machine operators, and elementary occupations. In total, 71.5% of black males and 79.0% of colored males were employed in these three occupational categories. White males were concentrated in managerial, technical, services, and craft/trade occupations. A total of 68.7% of white males were employed in these four occupations. The only overlapping occupation was craft/trade; 19.8% of black males were employed in this field, while 18.0% of colored males and 24.8% of white males were so employed. Similar occupational segregation occurred among women. Over half of the black and colored women were concentrated into elementary occupations and domestic workers. 23.3% black females and 32.3% of colored females were employed in elementary occupations, while over one-third of black women and one quarter of colored women were domestic workers. Less than 1% of white women were domestic workers. In contrast, over 50% of the white women were concentrated in clerical and technical occupations (44.8% and 21.7%, respectively).

In terms of industry, black and colored males were primarily employed in the agriculture, manufacturing, and service sectors, whereas white males were employed mainly in manufacturing, services, and trade. Women of all races were concentrated in the trade sector. A high percentage of black and colored women were employed in the household sector (35.1% and 25.3%, respectively) while less than 1% of white women were so employed. Rather, 21.1% of white women were employed in the finance sector, while less than 5% of black and colored women worked in finance.

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Model

To estimate the impact of minimum wage legislation on the South African labor market we take a two-step approach in this paper. First, we estimate an employment equation using a standard probit model. In this formulation an individual's employment status is a function of various demographic characteristics and locality variables. We also include a dummy variable to reflect whether the observation occurs before or after the minimum wage law was implemented. Our resulting probit equation is given as:

$$E_i = \alpha + \beta D_i + \gamma L_i + \delta M_i + u_i \quad (1)$$

where,

- E_i is the employment status of individual i ,
- D_i is a vector of demographic characteristics of individual i , including marital status, educational attainment, age, and whether the individual has received long-term job training (more than one month), short-term training (less than one month), or no job training,
- L_i is a vector of locality variables associated with individual i , including province and hours spent fetching water per week⁵,
- M_i is a dummy variable reflecting whether the observation occurred before or after the legislative change.
- α is a constant term,
- $\beta, \gamma,$ and δ are vectors of coefficients and
- u_i is a disturbance term.

The minimum wage dummy in equation 1 provides a rough test of whether or not it was more difficult to find employment after the implementation of the new wage rules, as expected in the traditional model of labor markets. In this paper we also include a term in the \mathbf{M} vector that interacts the minimum wage dummy variable with the education variable to test whether the legislation has had a differential impact on workers of different educational attainment levels.

Because the wage setting process reflects current and past institutional influences that vary along racial and gender lines, the employment equations are estimated for black, colored,

⁵ The last of the locality variables, hours spent fetching water per week, serves as a proxy for local economic development and the urban/rural status of the individual's residence.

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and white males and then again for black, colored, and white females using available data from the Statistics South Africa surveys. For each of the six population groups we estimate three employment equations - one for formal sector employment, one for informal sector employment, and one for overall employment.⁶ This estimation strategy allows us to identify which population groups may have been affected by the implementation of the new legislation and whether its effects are more prominent in the formal or informal labor market.

The second step in testing the impact of minimum wage legislation in South Africa involves estimating wage equations. Consider a standard Mincerian wage equation (Mincer and Polachek, 1974) in semi-log function form, given as:

$$\ln(w_i) = \alpha + \beta \mathbf{H}_i + \pi \mathbf{J}_i + \gamma \mathbf{L}_i + \delta \mathbf{M}_i + \varphi \boldsymbol{\lambda}_i + u_i \quad (2)$$

where, w is wages, \mathbf{H} is a vector that includes human capital attributes, \mathbf{J} is a vector of job characteristics, \mathbf{L} is a vector of location variables, \mathbf{M} is a vector of variables related to the imposition of the minimum wage legislation, β , π , γ , δ and φ are vectors of coefficients, α is a constant and u_i is a disturbance term.

For the wage equation, the dependent variable is the natural log of real hourly wage. In our formulation the independent variables used in the OLS regression are divided into three categories: human capital attributes, job characteristics, and local economy variables. The human capital vector contains information on the individual's highest education level achieved and his/her potential experience.⁷ Job characteristic variables include various dummies for the individual's occupation, union membership status, whether he/she worked in the public sector,

⁶ The last of these three estimations is also used to account for potential sample selection bias via a Heckman correction to the wage equation as discussed below.

⁷ Experience is estimated as the individual's age less their time in school minus the assumed age for entering school (5). However, since many people in the sample had so few years of schooling, we assumed a lower bound of 15 which means we assumed that any work experience before the age of 15 did not contribute to the market value of their adult work.

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and whether the position was permanent or temporary. In addition, we create industry dummy variables that indicate formal or informal employment sector.⁸ In our formulation we treat workers in the formal and informal sectors independently for two reasons. First, the formal and informal sectors of a given industry often consist of very different jobs, pay vastly different wages and attract different workers. Combining workers in formal and informal sectors together would distort the wage premium and discounts. And second, this research seeks to quantify the differential impacts of minimum wage legislation on the formal and informal sectors and by covered and uncovered sectors. The last group of variables shown in equation (2) simply includes dummies for the three most populous provinces – Western Cape, Gauteng, and KwaZulu-Natal. These variables serve as a proxy for differences in local economic conditions such as the prevailing wage and employment rates.

Because we are estimating wage equations, we limited the full LFS data to only those who are employed. However, our *a priori* assumption is that the likelihood of being employed, thus the likelihood of being in the sample, varied systematically by worker attributes. If so, the limited sample may exhibit selection bias. To correct for this possible selection bias we follow the standard Heckman (1979) two-stage approach, first estimating a selection equation then using it to calculate an Inverse Mills Ratio for each observation, which is then used as an explanatory variable in the second stage (wage) equation. Here our Inverse Mills Ratio (λ) is generated from third version of our estimation of equation (1). (See footnote 6.)

⁸ There are 9 industries in the data set, each is separated into formal and informal sectors as shown in Table 1. Of the 18 industrial codes, 17 are included in the regression. The excluded category includes those in the formal service sector. Thus the coefficients on the 17 dummies are interpreted relative to the formal service sector.

Results

Employment equations

Results of the formal employment equation for each of the six populations groups, including coefficient estimates and standard errors, are provided in Table 2. Many of the coefficients are significant at the 5 percent level and are of expected sign. More human capital, both in terms of formal education and work force training, is associated with a higher probability of being employed in the formal sector for many of the population groups. For males, marital status also enters these employment equations with the expected signs - being married is a positive predictor of active employment. However, for both black and white females, marital status is not significantly related to formal sector employment. The coefficients on age and age² indicate older workers are more likely to be employed, but the effects diminish with age. However, the opposite is true for white women, where younger women are more likely to be employed in the formal sector. Distance to water is included to proxy rural areas, lacking in public services. As expected, the coefficient on this variable is negative for black males and females and colored females indicating that individuals located in rural areas tended to be employed in the formal sector at a lower rate than those in more developed areas.

-----Insert Table 2 Here-----

The main result of interest for this paper involves the coefficients on the minimum wage dummy and the minimum wage/education interaction terms. Results show that the probability of being employed in the formal sector declined after the minimum wage laws were implemented for black and colored women. The positive and significant sign on the education/minimum wage

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term for these groups indicates that those workers on the higher end of the education spectrum were less adversely affected by the policy shift. Or stated differently, the disemployment effect of minimum wage legislation was larger among the less educated. Neither the minimum wage dummy nor the interaction term was significant for white males and females, and the dummy was actually positive for colored males. These results therefore suggest that workers in these groups were less affected by any disemployment effects of the policy change.

While there are other possible explanations for these results, they are consistent with the traditional neoclassical view that employment in covered sectors may be adversely impacted by minimum wages.

-----Insert Table 3 Here-----

Table 3 details the results of the informal employment equation, including coefficient estimates and standard errors, for each of the population groups. Many of these coefficients are also significant and carry different signs than in the formal employment equation. For instance, more human capital, in terms of both education and formal training, leads to a lower probability of being employed in the informal sector. The coefficients on marital status and age are mainly negative, indicating young, single men and women are more likely to be employed in the informal sector, a result that is intuitively reasonable for a developing country's labor market. For black men and women, poor access to public services, as proxied by the time spend fetching water per week, increases the probability of informal employment.

However, for the purposes of this paper, the main results from Table 3 relate to the minimum wage coefficient and the minimum wage times education interaction term. For black

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males and females and colored females, the dummy is significant and positive and the interaction term is significant and negative. These results imply that workers after the implementation of the wage legislation were more likely to be employed informally. The positive impact of the legislation on informal sector employment was more pronounced among individuals with lower educational attainment as shown by the negative and significant sign on the minimum wage/education interaction term. As before, these results provide no evidence of any impact on white male or female employment as a result (or concurrent with) the enactment of the wage floor.

Wage equations

Ordinary Least Squares regression results of the Mincerian wage equations depicted in equation (2) for each of the six population groups, including coefficient estimates and standard errors, are provided in Table 4. To conserve space standard errors for industry, occupation and region dummy variables are not presented. The coefficients on education are significant for all six equations presented in the table. Returns to education were the highest for white males, for whom each additional year of schooling led to an average increase in real hourly wage of 6.9%. White and colored females' returns to education were 5.4% and 5.2% respectively, while the returns to education for black and colored males were almost identical, 4.2% and 4.3%, respectively. However, black females only received a 3.6% rate of return for additional education. Based on the 95% confidence intervals for these coefficients, white males received statistically higher returns than either black or colored workers. Similarly, black females received lower returns to education than any other group.

-----Insert Table 4 Here-----

The economic returns to experience are also reported in Table 4. According to this sample, each year of work experience improved real hourly income by between 0.5% and 1.5%. Again, white males earned the highest returns, followed by white females and colored females. Point estimates indicate that each additional year of experience increased wages by less than 1% for black males and females.

Several job characteristics also proved to be significant determinants of wages. The wage premium for union membership for black and colored workers was quite large; unionized black females earned an average of 38.9% higher pay compared to non-unionized, similarly-qualified black females. For colored women, union membership paid a 30.2% wage premium, while the premium was 32.1% for black males and 26.4% for colored males. Union pay was only about 10% higher for white workers, compared to other, similarly-qualified white workers. These results are consistent with the role unions have historically played in South Africa - representing disadvantaged groups (black and colored workers, and women). Thus union membership among these populations accrues greater benefit than to white workers.

Public sector employment follows a similar pattern paying premiums averaging 46.8% for black females who are employed in this sector, a 35.5% premium among colored females, a 36.7% premium among black males, and a 24.8% premium among colored males. The public sector premium was only between 10 and 20% for white workers. These results are consistent with affirmative action policies that are geared toward previously disadvantaged groups. These policies are particularly effective in government employment.

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Results for the nine occupation groups are reported in Table 4 as well. Managerial, professional, technical, and clerical workers universally receive a premium compared to the excluded occupation – selected here as service workers. Most of the occupation coefficients that are statistically significant are positive, indicating that pay was at least as great for these occupations as pay for service workers. One exception is the negative coefficient for colored males and females in elementary occupations indicating pay discounts compared to those in service occupations. In addition, white women in elementary or household occupations earned less than white women in service occupations.

Industry dummy variables were also used in the estimation of the Mincerian wage equations as shown in equation (2). We designate eight formal sector industries and nine informal sector industries. The excluded category for estimation purposes is the formal sector *community, social and personal services* industry. As shown in the table all informal sector dummy variables contribute either negatively to the wage equation or are statistically insignificant. In other words, workers in the formal service industry earn higher reported wages, on average, than workers in any informal form of employment. Results for the formal sector industries are mixed. Women and white males earn a premium in the finance, insurance, real estate and business services industry. Black men in this industry, however, earn on average 10% less than similarly qualified black men in the formal service industry. Workers in the formal household industry also earn a considerable discount relative to their service industry counterparts. However, no white males or females were recorded as being employed in this industry. Similarly, most workers in the agricultural industries (both formal and informal) earn considerably lower wages than workers in the formal services industry. In general, the

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magnitudes of the coefficients for agriculture and household industries are larger than for most other industries indicating that these are the lowest paying industries.⁹

Effects of Minimum Wages

The results of the regression analysis shown in Table 4 are consistent with an improvement in wages in certain industries that corresponds with the enactment of the legislation. Each industry dummy was multiplied by a minimum wage dummy (0 for observations in 2002 or before and 1 for observations in 2003 and after) to arrive at the time/industry interaction term. The resulting coefficients are shown near the bottom of Table 4.

For black males, wages in the post-minimum wage period were higher than in the pre-minimum wage period for eight of the nine formal sector industries. Similarly, wages were higher for black females in six of the nine formal sector industries. This is shown by the positive and significant coefficient on the MIN*Industry variables. For men, point estimates indicate the largest increases occurred in the household sector (41.2%) and in the agricultural sector (39.9%); wages of black women increased by nearly 50% in the formal household sector and by 36.6% in the agricultural sector. Other sectors also experienced wage growth; however, the t-tests confirm that the impacts in the agricultural and household sectors exceed the impacts elsewhere.

Wages also rose for colored males in four formal sector industries and for colored females in two formal sector industries. Again, point estimates indicate that the major positive impacts occurred for men in the household sector (48.8%) and the agricultural sector (27.2%), and for women in those same industries, 31.8% and 29.0% respectively. However, due to lower

⁹ We performed the Heckman (1979) two-step correction for sample selection bias in this analysis. As part of this approach we therefore included the Inverse Mills Ratio (λ) as derived from the selection equation discussed in footnote 6. The selection equation used to calculate λ was identical to the employment equations reported in Tables 2 and 3 except the dependent variable was a simply employed/not employed binary variable. Results of the selection equation, again using a Probit model, are shown in the Appendix.

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sample sizes, t-tests cannot confirm that these two industries were the most positively affected. Finally, there were no statistically significant wage impacts observed during the period in the formal sector for either white males or white females.

The results also indicate that the impact of the minimum wage legislation on the informal sector was less broad. However, for five of the six population groups, wages in the informal agricultural sector improve when comparing pre- and post-minimum wage legislation periods. Similarly, the interaction terms were significant in the household industry for five of the six population groups, indicating an increase in wages between the pre- and post-legislation period. Other than these two industries there is no significant pattern of wage improvement or decline in the informal sector.

In sum, the results suggest that there was general improvement in wages among black and perhaps colored workers in formal labor markets around the time of the enactment of sweeping new minimum wage legislation. The improvements in wages were largest and most robust in the industries and among the individuals most affected by that legislation. However, our results indicate that wages also increased substantially in similar but uncovered informal industries. These results suggest that wage gains in the covered sector spilled over and benefited workers not covered by the policy revisions.

Conclusions

The South African labor market provides an interesting case study for examining the impacts of minimum wages for several reasons. One reason is the relatively distinct segmentation in the labor market—by race, gender, occupation/industry, and formal and informal sectors. The racial and gender distinctions are a remaining legacy of Apartheid. These differences are manifested in labor market outcomes such as differences in pay, employment, and occupational crowding. The high unemployment, strong unions, and active government intervention into the labor market contribute to a distinct informal market segment. South African labor policies differ by industry. In heavily unionized industries, terms of employment are negotiated through collective bargaining agreement. In industries with vulnerable, low paid workers, the Ministry of Labour established minimum wages in the Basic Economic Conditions Act, 2002. In particular, minimum wages were set for the agriculture and household workers.

Traditional competitive market model predicts that wages should be higher in the sectors impacted by an effective price floor and employment should be lower. The dual labor market adds that employment should be higher in the informal sector as workers and employers exit the formal market. However, the change in pay in the informal sector may be positive if a minimum wage premium in the formal sector spills over into the informal sector or pay may be lower as workers crowd into the informal sector, driving the price of informal labor down.

Our study examines labor market outcomes before and after the implementation of the minimum wage in 2002. We confirm that the probability of employment in the informal sector is higher after minimum wages are established for black and colored workers and that pay is also higher, indicating that the spillover effect outweighed the crowding-in effect for household and agricultural workers. Pay in the formal sector increased and probability of employment fell for black and colored workers. Pay and employment were not impacted by the implementation of

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minimum wages for agricultural and household workers, likely because white workers are not heavily represented in the impacted industries and because white workers, on average, earn sufficiently high pay that the wage floor is ineffective.

Thus in this developing, segmented economy, the enactment of the minimum wage did raise both employment and pay for the most vulnerable workers in the informal sector and did not impact the higher income groups. The actual covered workers do receive higher pay, but with the added risk of unemployment.

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Table 1: Descriptive Statistics - Sept 2000-2007

	Male			Female		
	Black	Coloured	White	Black	Coloured	White
Wages (ln Rand/hr)	1.76 (0.96)	1.85 (0.87)	3.22 (0.86)	1.48 (1.05)	1.71 (0.87)	2.94 (0.78)
Education (Yrs)	7.83 (4.25)	7.53 (3.90)	12.30 (2.48)	8.37 (4.44)	8.14 (3.75)	12.59 (2.34)
Experience (Yrs)	22.16 (10.99)	22.02 (11.19)	21.61 (11.38)	22.61 (10.63)	20.84 (10.53)	20.77 (11.31)
Union (%)	.341	.251	.352	.241	.225	.289
Government (%)	.164	.146	.224	.205	.130	.256
Permanent (%)	.689	.754	.915	.636	.702	.903
Industry (%)						
Agriculture (F)	0.138	0.331	0.042	0.074	0.177	0.020
Agriculture (I)	0.031	0.027	0.002	0.015	0.010	0.002
Mining (F)	0.120	0.021	0.115	0.005	0.003	0.022
Mining (I)	0.001	0.001	0.002	0.000	0.000	0.000
Manufacturing (F)	0.140	0.136	0.201	0.090	0.119	0.102
Manufacturing (I)	0.009	0.007	0.004	0.006	0.005	0.001
Construction (F)	0.072	0.086	0.036	0.013	0.007	0.010
Construction (I)	0.036	0.030	0.004	0.006	0.001	0.000
Trade (F)	0.115	0.108	0.187	0.131	0.187	0.202
Trade (I)	0.014	0.007	0.005	0.017	0.007	0.005
Transportation (F)	0.043	0.037	0.077	0.009	0.008	0.039
Transportation (I)	0.016	0.003	0.001	0.002	0.001	0.000
Finance (F)	0.062	0.038	0.128	0.044	0.047	0.208
Finance (I)	0.004	0.002	0.002	0.002	0.001	0.003
Services (F)	0.137	0.123	0.187	0.219	0.161	0.363
Services (I)	0.006	0.005	0.007	0.016	0.012	0.013
Household (F)	0.004	0.003	0.000	0.012	0.012	0.000
Household (I)	0.052	0.035	0.002	0.339	0.241	0.008
Occupation (%)						
Managerial	0.012	.0173	.172	.007	.012	.073
Professional	0.019	.0093	.093	.030	.013	.105
Technical	0.049	.0395	.156	.103	.073	.217
Clerks	0.046	.0431	.083	.087	.119	.448
Services	0.117	0.067	.111	.106	.125	.112
Agricultural	0.032	.0281	.006	.008	.005	.001
Craft and Trades	0.198	.1798	.248	.040	.039	.016
Machine operators	0.216	.1336	.078	.040	.045	.007
Elementary Occ.	0.301	.4762	.053	.233	.323	.014
Domestic workers	0.010	.0059	.000	.345	.247	.007
Province (%)						
Western Cape	0.053	0.588	0.145	0.043	0.604	.165
KwaZulu-Natal	0.189	0.014	0.100	0.236	0.016	.105
Gauteng	0.183	0.024	0.261	0.155	0.030	.249
Other	0.575	0.374	0.495	0.566	0.350	.482
Total observations	49,810	11,478	3,944	37,884	9,433	3,470

MINIMUM WAGES IN A SEGMENTED LABOR MARKET

Table 2 : Formal Employment Equation, Probit Results (Sept 2000 - 2007)

Coefficient	Male			Female		
	Black	Coloured	White	Black	Coloured	White
Constant	-3.162 *	-1.261 *	-0.917 *	-4.393 *	-2.746 *	0.681 *
	(0.048)	(0.111)	(0.182)	(0.055)	(0.121)	(0.203)
Education	0.036 *	0.027 *	0.075 *	0.100 *	0.108 *	-0.089 *
	(0.002)	(0.004)	(0.008)	(0.002)	(0.005)	(0.009)
Marital Status	0.599 *	0.554 *	0.458 *	-0.007	0.127 *	-0.023
	(0.009)	(0.022)	(0.034)	(0.009)	(0.020)	(0.033)
Water	-0.289 *	0.074	-0.328	-0.471 *	-0.219 *	0.171
	(0.012)	(0.049)	(0.176)	(0.011)	(0.053)	(0.174)
Training (low level)	0.242 *	0.201 *	0.069	0.161 *	0.265 *	-0.069
	(0.023)	(0.056)	(0.073)	(0.032)	(0.063)	(0.087)
Training (high level)	0.188 *	0.037	-0.025	0.236 *	0.291 *	0.074 *
	(0.013)	(0.033)	(0.034)	(0.016)	(0.038)	(0.037)
Age	0.122 *	0.050 *	0.049 *	0.125 *	0.069 *	-0.030 *
	(0.002)	(0.006)	(0.008)	(0.003)	(0.006)	(0.009)
Age^2	-0.001 *	-0.001 *	-0.001 *	-0.001 *	-0.001 *	0.0003 *
	(0.00003)	(0.00007)	(0.00010)	(0.00004)	(0.00008)	(0.00011)
Minimum Wage	-0.008	0.096 *	0.140	-0.096 *	-0.123 *	0.112
	(0.017)	(0.046)	(0.130)	(0.021)	(0.051)	(0.146)
Min*Education	0.011 *	-0.002	-0.004	0.010 *	0.012 *	-0.005
	(0.002)	(0.005)	(0.010)	(0.002)	(0.005)	(0.012)
Western Cape	0.372 *	0.383 *	-0.060	0.221 *	0.484 *	0.008
	(0.020)	(0.019)	(0.037)	(0.022)	(0.019)	(0.038)
KwaZulu-Natal	-0.070 *	0.089	-0.116 *	0.158 *	0.258 *	-0.014
	(0.010)	(0.067)	(0.046)	(0.010)	(0.066)	(0.049)
Gauteng	0.102 *	-0.078	-0.137 *	0.044 *	0.198 *	0.073 *
	(0.010)	(0.049)	(0.034)	(0.012)	(0.048)	(0.035)
<u>Pearson Goodness of Fit</u>						
Significance	0.232	0.279	0.645	0.000	0.257	0.272

MINIMUM WAGES IN A SEGMENTED LABOR MARKET

Table 3 : Informal Employment Equation, Probit Results (Sept 2000 - 2007)

Coefficient	Male			Female		
	Black	Coloured	White	Black	Coloured	White
Constant	2.493 * (0.046)	0.986 * (0.112)	0.608 * (0.186)	2.990 * (0.051)	2.168 * (0.119)	-1.046 * (0.199)
Education	-0.038 * (0.002)	-0.030 * (0.004)	-0.067 * (0.008)	-0.082 * (0.002)	-0.101 * (0.004)	0.103 * (0.009)
Marital Status	-0.498 * (0.009)	-0.511 * (0.022)	-0.448 * (0.034)	-0.001 (0.009)	-0.106 * (0.020)	0.004 (0.032)
Water	0.263 * (0.012)	-0.064 (0.049)	0.365 * (0.175)	0.363 * (0.010)	0.097 (0.051)	-0.132 (0.174)
Training (low level)	-0.219 * (0.023)	-0.148 * (0.056)	-0.016 (0.073)	-0.118 * (0.031)	-0.285 * (0.065)	0.118 (0.086)
Training (high level)	-0.191 * (0.013)	-0.062 (0.034)	0.016 (0.034)	-0.259 * (0.016)	-0.307 * (0.039)	-0.087 * (0.036)
Age	-0.107 * (0.002)	-0.047 * (0.006)	-0.044 * (0.008)	-0.092 * (0.003)	-0.059 * (0.006)	0.033 * (0.009)
Age^2	0.001 * (0.00003)	0.001 * (0.00007)	0.001 * (0.00010)	0.001 * (0.00003)	0.001 * (0.00008)	0.000 * (0.00011)
Minimum Wage	0.302 * (0.017)	0.072 (0.046)	0.064 (0.132)	0.650 * (0.019)	0.410 * (0.049)	0.179 (0.144)
Min*Education	-0.005 * (0.002)	0.006 (0.005)	-0.005 (0.011)	-0.018 * (0.002)	-0.015 * (0.005)	-0.008 (0.011)
Western Cape	-0.353 * (0.020)	-0.358 * (0.019)	0.074 * (0.038)	-0.152 * (0.021)	-0.433 * (0.019)	0.007 (0.038)
KwaZulu-Natal	0.064 * (0.010)	-0.081 (0.068)	0.113 * (0.047)	-0.122 * (0.010)	-0.209 * (0.066)	0.011 (0.048)
Gauteng	-0.101 * (0.010)	0.041 (0.050)	0.148 * (0.035)	-0.058 * (0.011)	-0.245 * (0.049)	-0.060 (0.035)
<u>Pearson Goodness of Fit</u> Significance	0.390	0.216	0.642	0.000	0.354	0.267

MINIMUM WAGES IN A SEGMENTED LABOR MARKET

Table 4: Wage Equation, OLS Regression Results (Sept 2000 - 2007)

Coefficient	Male			Female		
	Black	Coloured	White	Black	Coloured	White
Constant	1.050 *	1.398 *	1.446 *	0.946 *	0.977 *	1.434 *
	(0.026)	(0.051)	(0.104)	(0.037)	(0.067)	(0.121)
Education	0.042 *	0.043 *	0.069 *	0.036 *	0.052 *	0.054 *
	(0.001)	(0.002)	(0.006)	(0.001)	(0.003)	(0.007)
Experience	0.007 *	0.010 *	0.015 *	0.005 *	0.010 *	0.011 *
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Union	0.321 *	0.264 *	0.107 *	0.389 *	0.302 *	0.117 *
	(0.008)	(0.015)	(0.027)	(0.011)	(0.018)	(0.027)
Government	0.367 *	0.248 *	0.103 *	0.468 *	0.355 *	0.191 *
	(0.012)	(0.024)	(0.037)	(0.015)	(0.027)	(0.033)
Permanent	0.211 *	0.182 *	0.344 *	0.135 *	0.079 *	0.266 *
	(0.008)	(0.014)	(0.042)	(0.008)	(0.014)	(0.038)
Location						
Western Cape	0.279 *	0.173 *	0.083 *	0.443 *	0.256 *	0.165 *
KwaZulu-Natal	0.144 *	0.224 *	0.024	0.052 *	0.272 *	0.171 *
Gauteng	0.238 *	0.488 *	0.134 *	0.372 *	0.424 *	0.280 *
Occupation						
Managerial	0.972 *	0.846 *	0.510 *	0.948 *	0.628 *	0.549 *
Professional	0.840 *	0.790 *	0.525 *	0.875 *	0.681 *	0.509 *
Technical	0.560 *	0.485 *	0.405 *	0.643 *	0.486 *	0.401 *
Clerical	0.356 *	0.280 *	0.171 *	0.413 *	0.326 *	0.167 *
Agricultural	0.080 *	-0.051	0.248	0.081	0.160	0.294
Craft and Trades	0.193 *	0.093 *	0.100 *	0.060 *	-0.068	0.125
Machine operator	0.162 *	0.061 *	-0.055	0.028	-0.018	-0.076
Elementary Occ.	0.023	-0.145 *	-0.021	0.019	-0.104 *	-0.285 *
Domestic	-0.008	-0.150	-0.247	0.176 *	0.310 *	-0.785 *
Formal Sector						
Agriculture	-0.819 *	-0.765 *	-0.507 *	-0.544 *	-0.562 *	0.283 *
Mining	0.083 *	0.141	0.384 *	0.157	0.501 *	0.529 *
Manufacturing	0.001	0.041	0.226 *	-0.110 *	0.118 *	0.350 *
Construction	-0.105 *	-0.121 *	0.119	0.067	0.245	0.158
Trade	-0.206 *	-0.169 *	-0.086	-0.122 *	-0.066	-0.005
Transportation	-0.142 *	0.050	0.123	0.098	0.394 *	0.177 *
Finance	-0.103 *	-0.093	0.198 *	0.168 *	0.222 *	0.222 *
Household	-0.896 *	-1.002 *	--	-0.807 *	-0.886 *	--
Informal Sector						
Agriculture	-1.044 *	-0.848 *	-1.004 *	-0.674 *	-0.616 *	0.267
Mining	-0.183	-0.099	0.137	-0.700	-0.219	--
Manufacturing	-0.249 *	-0.056	-0.044	-0.403 *	0.042	0.028
Construction	-0.327 *	-0.219 *	-1.032 *	-0.366 *	0.082	--
Trade	-0.595 *	-0.487 *	-0.287	-0.599 *	0.044	-0.174
Transportation	-0.563 *	-0.250	-0.519	-0.537 *	--	0.283
Finance	-0.471 *	-0.467 *	-0.947 *	-0.232	-0.706 *	0.113
Services	-0.316 *	-0.151	-0.260	-0.402 *	-0.233 *	-0.276 *
Household	-0.614 *	-0.737 *	-1.206 *	-0.628 *	-0.867 *	-0.705 *

MINIMUM WAGES IN A SEGMENTED LABOR MARKET

Table 4: Wage Equation, OLS Regression Results (Sept 2000 - 2007), cont.

Coefficient	Male			Female		
	Black	Coloured	White	Black	Coloured	White
<u>Formal Sector</u>						
MIN * Agriculture	0.399 *	0.272 *	0.171	0.366 *	0.290 *	-0.310
MIN. * Mining	0.165 *	0.159 *	0.085	0.231 *	-0.206	-0.027
MIN * Manufacturing	0.072 *	-0.083	0.030	0.088 *	0.031	-0.087
MIN * Construction	0.091 *	0.088 *	0.038	-0.145	-0.329	-0.121
MIN * Trade	0.049 *	-0.040	0.015	0.045 *	-0.048	-0.077
MIN * Transportation	0.097 *	-0.029	-0.036	-0.002	-0.101	0.151
MIN * Finance	-0.014	-0.084	-0.025	-0.055	-0.120 *	0.024
MIN * Services	0.070 *	-0.002	0.049	0.050 *	-0.076 *	0.047
MIN * Household	0.412 *	0.488 *	--	0.492 *	0.318 *	0.672
<u>Informal Sector</u>						
MIN * Agriculture	0.329 *	0.346 *	1.545 *	0.322 *	0.227 *	-0.164
MIN. * Mining	0.069	-0.818 *	1.419	0.814	--	--
MIN * Manufacturing	-0.020	0.049	0.012	0.094	-0.071	-0.502
MIN * Construction	0.083 *	0.056	0.430	0.192	-0.581	--
MIN * Trade	0.055	0.223	-0.612	-0.020	-0.440 *	-0.254
MIN * Transportation	0.072	0.182	0.002	-0.109	-0.377	--
MIN * Finance	0.168	-0.022	0.986	0.433 *	0.492	-0.430
MIN * Services	-0.031	-0.168	0.093	0.027	-0.165	0.214
MIN * Household	0.269 *	0.286 *	0.432	0.236 *	0.224 *	1.088 *
□	-0.226 *	-0.369 *	-0.602 *	-0.247 *	-0.143	-0.300
R-square	0.525	0.571	0.349	0.608	0.540	0.306
Adj. R-square	0.525	0.569	0.342	0.608	0.537	0.298
F-stat	1114.9	327.1	52.0	854.0	193.3	37.5

MINIMUM WAGES IN A SEGMENTED LABOR MARKET

Appendix : Selection Equation, Probit Results (Sept 2000 - 2007)

Coefficient	Male			Female		
	Black	Coloured	White	Black	Coloured	White
Constant	-3.889 *	-2.311 *	-4.027 *	-5.194 *	-3.562 *	-3.734 *
	(0.040)	(0.097)	(0.155)	(0.039)	(0.093)	(0.139)
Education	0.010 *	0.012 *	0.084 *	0.034 *	0.049 *	0.112 *
	(0.001)	(0.004)	(0.007)	(0.001)	(0.004)	(0.006)
Marital Status	0.711 *	0.680 *	0.647 *	-0.086 *	-0.067 *	-0.302 *
	(0.009)	(0.020)	(0.032)	(0.007)	(0.016)	(0.024)
Water	-0.123 *	0.274 *	-0.233	-0.231 *	-0.061	0.064
	(0.011)	(0.047)	(0.158)	(0.008)	(0.042)	(0.132)
Training (low level)	0.330 *	0.283 *	0.224 *	0.234 *	0.343 *	0.535 *
	(0.024)	(0.057)	(0.072)	(0.029)	(0.058)	(0.071)
Training (high level)	0.327 *	0.101 *	0.206 *	0.302 *	0.403 *	0.278 *
	(0.014)	(0.033)	(0.033)	(0.015)	(0.035)	(0.029)
Age	0.187 *	0.130 *	0.213 *	0.229 *	0.166 *	0.162 *
	(0.002)	(0.005)	(0.007)	(0.002)	(0.005)	(0.006)
Age^2	-0.002 *	-0.002 *	-0.003 *	-0.003 *	-0.002 *	-0.002 *
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Minimum Wage	-0.064 *	-0.076	0.144	-0.251 *	-0.209 *	-0.085
	(0.015)	(0.040)	(0.113)	(0.013)	(0.037)	(0.103)
Min*Education	0.017 *	0.014 *	-0.009	0.019 *	0.018 *	0.007
	(0.002)	(0.005)	(0.009)	(0.002)	(0.004)	(0.008)
Western Cape	0.341 *	0.374 *	-0.125 *	0.253 *	0.376 *	-0.055 *
	(0.019)	(0.018)	(0.032)	(0.019)	(0.016)	(0.026)
KwaZulu-Natal	-0.046 *	0.017	-0.024	0.160 *	0.151 *	0.087 *
	(0.009)	(0.062)	(0.042)	(0.008)	(0.057)	(0.034)
Gauteng	0.200 *	-0.005	-0.037	0.130 *	0.225 *	0.070 *
	(0.010)	(0.048)	(0.031)	(0.010)	(0.042)	(0.025)
<u>Pearson Goodness of Fit</u>						
Significance	0.349	0.253	0.876	0.00004	0.195	0.015

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