RESEARCH REPORT

THE EFFECTS OF MINIMUM WAGE ON MALES' AND FEMALES' EMPLOYMENT, EARNINGS AND HOURS OF WORK IN SOUTH AFRICA

A Research Report submitted in partial fulfilment of the Degree of
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by

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ABSTRACT

In this study we use the Difference-in-Differences estimator to investigate whether the effects of the national minimum wage on wages, hours of work, and employment differ for male and female workers in South Africa. We use panel data constructed from StatsSA's Quarterly Labour Force Surveys from 2018Q2 to 2019Q3. Findings from our study show that on average, the national minimum wage has a positive effect on wages for females and males, but the effect was greater for males compared to females. This suggests a gender gap in the effect of the national minimum wage among South African workers. On the hours of work variable, our results provide proof that the effect of the national minimum wage on hours of work also differs for males and females. The estimates show that the national minimum has a negative wage effect on hours of work for females, while for males the law has a positive effect. On employment for female workers, the introduction of the national minimum wage negatively affected the chances of staying employed while for male workers, introducing the national minimum wage had no effect on the probability of staying employed. These results suggest that the national minimum wage contributes to gender inequalities in the South African labour market which requires complementary measures that aim toward closing the induced gender gaps.

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SECTION 1. INTRODUCTION

Policies on minimum wage are widely analysed in labour economics (Karakitsiosis & Matsaganis, 2018). One key issue discussed in this field is the effect of the minimum wage on poverty and inequality as well as its ability to redistribute wealth. At a political level, minimum wage increase policies are favoured as they are believed to lead to increases in income for the working class as well as reducing wage inequality.

According to International Labour Organisation (2021), 90% of the 187 ILO Member states have established a minimum wage system of some sort. These minimum wage systems differ across countries, some are derived from a single national minimum wage, while some are sector-based. In South Africa, the minimum wage legislation was passed in 1999. The country has adopted a minimum wage system that varies both across and within sectors of the economy. Within sectors, wages can differ based on the type of occupation and geographical location. However, the national minimum wage (NMW) was first established in 2019 and set at R20 per hour (Bhorat et al., 2021). It was also characterised by some sectoral differences as the wage rates for government public workers, domestic workers and farm workers were set at R11 per hour, R15 per hour and R18 per hour, respectively (Bhorat et al., 2021). In March 2021, the NMW was adjusted to R21.69 per hour (Department of Labour (DoL), 2021). The wage floor for the agriculture sector was increased to R21.69 while for domestic workers and government public workers this was pegged at R19.09 and R12.75 per hour, respectively (DoL, 2021). In March 2022, a new NMW hike was announced at R23.19, this was an increase of 6.9% from the 2021 value (DoL, 2022). This new rate was also applicable to farm and domestic workers, there was no adjustment for government public workers (DoL, 2022).

The South African government introduced the minimum wage policy in order to stimulate economic growth and lower poverty and inequality (Adelzadeh & Alvillar, 2016). However, the country has been experiencing weak economic growth together with high poverty and inequality levels. While there have been little improvements in poverty levels in post-apartheid in South Africa, inequality levels have exacerbated (Leibbrandt et al., 2010). According to Statistics South Africa - StatsSA (2020), South Africa is included in countries with the highest inequality in the world. In 2006, the country reported a per capita expenditure Gini-coefficient of 0.67 and in 2020 the Gini-coefficient stood at 0.63 (StatsSA, 2020). In 2015, 55.5% of the population in South Africa (30.3 million individuals) lived at the upper bound poverty line (StatsSA, 2017). Also, unemployment rates across all age groups are higher for females compared to males but are severely high for the youth aged 15-24: 54% of young females are

unemployed compared to 45% for young males (OECD, 2020). This relatively disadvantaged labour market position for females extends to remuneration. Female workers earn approximately 30% less than male workers, on average (StatsSA, 2020).

Policies on minimum wage are geared towards improving wages for lowly paid workers hence they may induce some changes in wages, hours of work and employment, given the structure of the labour market. Theory posits, a minimum wage that is greater than the equilibrium wage causes unemployment in a perfectly competitive labour market, while it increases wages and employment in a monopsonistic labour market (Borjas, 2016). There is also a vast empirical literature on minimum wages and their effects on labour market outcomes. Since the seminal works of Card and Krueger (1994) some studies from developed countries have established that minimum wages have little to no impact on employment (c.f. Dickens et al., 1999; Stewart, 2002). This conclusion also extends to some studies from developing countries. For instance, Lemos (2004) found that minimum wages in Brazil led to a small decrease in overall employment.

Currently, there are a few but growing number of studies in South Africa that study minimum wage policies and their effects on labour market outcomes. Some studies concentrate on the effect of the minimum wage policy on overall employment, wages, and hours of work, while others concentrate on covered sectors only (Bhorat et al., 2012; Bhorat et al., 2021; Dinkelman & Ranchhod, 2010). Given that the South African labour market is segmented, other studies dwell on the effect of the minimum wage on dual labour markets (Millea et al., 2017). A small number of researchers examine the impact of minimum wages on men and women's labour market outcomes with particular attention on domestic workers – a subset of lowly paid South Africans of which a large proportion are women (Hertz, 2005; Dinkelman & Ranchhod, 2010; Bhorat et al., 2013). Findings from Hertz (2005) in the domestic sector indicate that full/part-time employment decreased by 10-12% for females while males' employment increased by 14-15%. While these studies are informative, they paint an incomplete picture of how minimum wages in South African affect labour market outcomes and opportunities. Moreover, males and females' jobs differ greatly across sectors, industries, and occupations and in terms of allocation of time to paid work therefore examining them together ignores these differences. There is a contribution to be made to ascertain whether these minimum wage effects differ for men and women in other sectors.

In this study, we extend the discussion by including men and women in other sectors of the economy and also focus on recent minimum wage adjustments in South Africa. The study's objective is to evaluate whether the impact of the national minimum wage on labour market outcomes differs for males and females in South Africa. The specific research questions are as follows:

-What is the effect of the national minimum wage policy on hours of work for males and females in South Africa?

-What is the effect of the national minimum wage policy on male and female employment in South Africa?

-What is the effect of the minimum wage policy on wages for males and females in South Africa?

Answering these questions is relevant in developing countries like South Africa where there is considerable gender inequity in the labour market and higher poverty among female-headed than male-headed households (Rogan, 2016). Females make a large proportion of low skilled, low paid employment and are also faced with relatively higher unemployment. The analysis in this study is based on a panel dataset constructed from 2018 and 2019 Quarterly Labour Force surveys and the Difference in Differences (DID) estimation method. The results serve to enhance our understanding of whether minimum wages are an effective policy tool to improve labour market outcomes for South African men and women and work towards poverty eradication. This will aid initiatives to reduce gender inequalities that are prevalent in the South African labour market, which is important for socio-economic development.

The current research is structured as follows; we present the background to the study in Section 2. Section 3 presents a review of the relevant empirical and theoretical literature. Section 4 discusses the data and methodology for the study. The results are discussed in Section 5 while Section 6 concludes the study.

SECTION 2. BACKGROUND TO THE STUDY

This section contextualises the present study by discussing the current state of minimum wage regulation, and different labour market outcomes for men and women in South Africa.

Although the national minimum wage legislation was first passed in 2019, South Africa has had a number of sectoral determinations which are issued by the Department of Labour. They stipulate a wage floor in order to improve incomes of lowest paid workers and elevate them out of poverty by increasing their incomes in certain categories of economic sectors (Department of Planning, Monitoring & Evaluation (DPME), 2008). In South Africa there is a high number of vulnerable groups of workers, therefore, it is crucial that they are protected by minimum wage laws in order to avoid exploitation by employers. After South Africa gained its democratic independence in 1994, the labour law was one of the first laws to be revised (DPME, 2008). In 1999 the first binding minimum wage in South Africa was established to improve wages for employees within the contract cleaning sector. Following the introduction of the minimum wage in the contract cleaning industry, minimum wages were then put in place for workers in the Civil Engineering and Private Security sectors in 2001 (Bhorat et al., 2012). Following that, minimum wages have been put in place in other sectors covering groups of workers that are low paid.

Other than private negotiations of wages, in South Africa, wage formation are determined by collective bargaining through trade unions and in cases where collective bargaining is not applicable government can intervene. In collective bargaining, bargaining councils can present and enforce collective agreements regarding wages and other terms of employment on behalf of organised employees. In cases where employees are not organised, especially cases of vulnerable groups government can intervene and enforce a minimum wage and other terms employment (Visser & Ferrer, 2015).

Post-1994 elections there were various restructuring processes across different sectors of the economy. In the agricultural sector, these restructuring processes included deregulation of the sector by removing protective tariff regimes, withdrawing subsidies, and removing state-controlled marketing boards (Visser & Ferrer, 2015). The Sectoral Determination 8 was launched in 2008 and outlined the minimum wage rate for farm workers as well as their minimum working conditions of employment. In 2006 the Sectoral Determination 8 became the Sectoral Determination 13 where minimum wages ranged from a monthly wage of R650 to R800 based on the area of employment. The area distinction was revised by including a

nationally binding minimum wage for the sector. Since then, minimum wages are amended after three years, and the wage rate increment carried out on yearly basis depending on Statistics South Africa's estimated Consumer Price Index (Ledger, 2016). Currently, employers in the agricultural industry are expected to pay their employees a national minimum wage of R23.19 per hour.

The female dominated sector in South Africa is the domestic sector which employs over half a million individuals (Kubjana, 2016). According to Hertz (2005), in 2002, about a million of domestic workers were Black and Coloured women. It was only with the introduction of the Sectoral Determination 7 of the Basic Condition of Employment Act in 1997 that the state began to consider issues related to this sector and regulate the sector as an occupation. The Unemployment Insurance Act 64 of 2001 as well as the Unemployment Insurance Contributions Act 4 of 2002 were put in place in order to pass the responsibility to the employer of the domestic worker by registering for the Unemployment Insurance Fund at the Department of Labour. The employer and the worker were each required to pay a percentage of the worker's monthly salary, however, only a few registered (Kubjana, 2016). Living conditions for individuals in this sector continue to be dire, thus, these regulations have proven to be insufficient in bettering the standard of living for individuals in this sector (Kubjana, 2016). The minimum hourly wage for domestic workers has since then increased from R3.74 in 2002, to R13.69 in 2019, to R15.00 in 2019 with a recent increase of R23.19 in 2022 (DoL, 2022).

In other sectors, minimum wages are governed by sectoral determination to try to improve labour market outcomes for workers in this sector. In the private security sector minimum, hourly wages are determined by grade and currently range from R23.19 to R27.70.

In the transport sector, the minimum wage is set depending on the vehicle type for drivers and ranges from R28.86 to R31.44 per hour. In the retail and wholesale trade sector, the minimum wage is set depending on individuals' years of experience, job type and district. Individuals employed in the wholesale and retail trade industry currently earn a minimum wage rate that ranges from R23.19 to R62.00 per hour. In the contract cleaning sector, minimum wages are determined by area type and currently range from 23.27 to R25.52 per hour (DoL, 2022).

Policy changes have been made to try to improve labour market conditions for women in South Africa in order to ensure that women receive equal opportunity and equal treatment to men in labour markets (Mosomi & Wittenberg, 2020). Implementation of minimum wages in low paying industries under the Basic Conditions of Employment Act 75 of 1997 has been an

additional factor that has influenced the reduction in the pay gap between men and women (Mosomi, 2019). According to Mosomi and Wittenberg (2020), wage ratios for women have increased among all employees, however, compared to men, women still earn lower wages. Female to male pay ratios have increased from 79% in 2007 to 84% in 2017, (Mosomi & Wittenberg, 2020). These comparisons are based on simple comparisons median pay per hour for female and male workers and exclude earnings that depend on composition effects that include educational attainment and industry of employment (Mosomi & Wittenberg, 2020). Mosomi (2019) controls for demographic and firm specific effects and found a higher adjusted gender wage gap of 23% to 35%. Although labour force participation rates for women have been increasing between 2010 and 2019, they are still lower than participation rates for men (World Bank, 2020). Women in South Africa are still faced with more factors that impede their access to employment opportunities and for those that are employed, it is difficult to obtain positions that involve decision-making and jobs in certain industries, or of certain characteristics (StatsSA, 2021). Hence there is need to promote fair access and equal treatment of women in the labour market.

SECTION 3. LITERATURE REVIEW

In this section, we present a brief review of empirical and theoretical literature on the effects of minimum wage on male and female employment, wages, and hours of work in developed and developing economies.

3.1. EMPIRICAL LITERATURE REVIEW

Since the seminal work of Card and Krueger (1994) on the impact of the minimum wage on labour market outcomes in the fast-food industry in the United States of America, there has been an increase in literature on minimum wage effects on labour market outcomes in both developed and developing countries.

Evidence from developed countries indicate that minimum wage increase resulted in a small effect on employment while some found no effect on employment (Stewart, 2004). Stewart (2004) uses panel data from 3 different datasets to investigate the effect of the implementation of the minimum wage in the U.K. on the likelihood of staying employed for those whose are eligible of a minimum wage increase when the law came into effect. Findings from the study indicate that the introduction of the policy had a statistically insignificant effect on the likelihood of staying employed across all demographic groups, implying that the implementation of the wage floor policy had an insignificant effect on employment for adults, youth, men, and women. Bruttel (2019) uses qualitative research as well as the DID method to study the effects of a new wage floor on hourly wages, monthly wages, hours of work and employment in Germany. Findings from this study show that the new wage floor significantly increased the hourly wage for covered workers. The increase in hourly wages, however, did not result in an increase in monthly wages as findings from the study show that employers significantly reduced the hours of work for their employees. No effect was found on employment.

For developing countries, there has been mixed evidence on the impact of the minimum wage on labour market outcomes. To understand whether minimum wages are an effective policy tool, Ham (2017) uses repeated cross-sectional surveys to study the effects of minimum wages on employment and wages in Honduras. Results from this study indicate that the minimum wage had negatively affected employment within the formal sector, and positively affected employment for individuals in the informal sector. The minimum wage hike also led to negative net effect on wages. Imobighe (2007) investigates the impact of minimum wages on employment level and productivity in Nigeria. Findings from this study shows that minimum wages had no serious negative impact on employment while they had a positive effect on

productivity. In Kenya they found strong disemployment effects of the minimum wage law in the formal public sector within a short and a long period. Strong and positive effects on employment were found in the private sector only over a long period (Manda et al., 2007).

The mixed evidence on the effects of minimum wages on employment, wages and hours of work from developing countries extends to South Africa. Some South African studies shows that sectoral minimum wages have different effects on labour market outcomes across sectors (Bhorat et al., 2012; Bhorat et al., 2012, Hertz, 2002; Millea et al., 2017). For instance, Bhorat et al. (2012) investigate the effect of the sectoral minimum wage law within the agricultural sector for the period between 2000 and 2007. The results indicate that employment fell significantly, while average wages increased and there was no effect on hours worked. Dinkelman and Ranchhod (2010) assess how in the short run the introduction of the minimum wage law impacts employees in the informal domestic work industry for the 2001-2004 period. Their findings show that employment for domestic workers was not significantly affected by the minimum wage law. On average, wages for all domestic workers increased significantly by 20.2% while no effect was found on hours of work. Although this study focuses on the domestic worker industry, of which a large proportion of its employees are females, it does not clearly depict how women across all sectors are affected by the minimum wage, moreover, it only includes the informal sector. This shortfall also extends to Hertz (2002).

Bhorat et al. (2021) quantify the effect of the national minimum wage on short term wages, hours of work and employment in South Africa. Findings indicate a weak minimum wage effect on wages, no employment effect, and a small increase in hours of work. This may be due to non-compliance by employers. Employers may fail to comply with minimum wage laws, especially in developing economies where law enforcement is weak, and as such, the direct effect of a minimum wage policy on labour market outcomes may be uncertain (Bhorat et al., 2021). This study pools men and women together which masks any gender disparity in the impact of the national minimum wage as females when compared to males may have a higher chance of being employed in low paying industries. Moreover, roles played by women in their families as well as access to welfare benefits are likely to limit the mobility of women, thereby increasing their chances of being employed in low pay jobs further when faced with an employer with monopsony power (Rubery & Grimshaw, 2009).

Jia (2004) split the men and women regressions to study how the minimum wage affects employment and usual hours of work for individuals with low educational levels in China.

Results from this study show that for males, after minimum wage hike there was no change in employment while for hours of work there was a significant increase after the minimum wage hike. On the other hand, results for females show that a minimum wage hike has an insignificant impact on weekly hours of work, while employment for women was adversely affected.

Evidence from Japan, by Kawaguchi & Mori (2021), shows that minimum wages resulted in a significant wage increase for low paid workers. Most wages converged towards the minimum wage between 2000 and 2017. Employment for young and less educated men decreased significantly relative to other demographic groups including young women, while there was an insignificant impact on hours of work in any of the demographic groups investigated.

In light of the inconclusive evidence, this study investigates whether the minimum wage policy has different effects on male and female employment, wages, and hours of work in South Africa across all sectors of the economy. The study considers the heterogeneous nature of the sectors and employs a Difference in Difference estimation method using recent data.

3.2. THEORETICAL FRAMEWORK

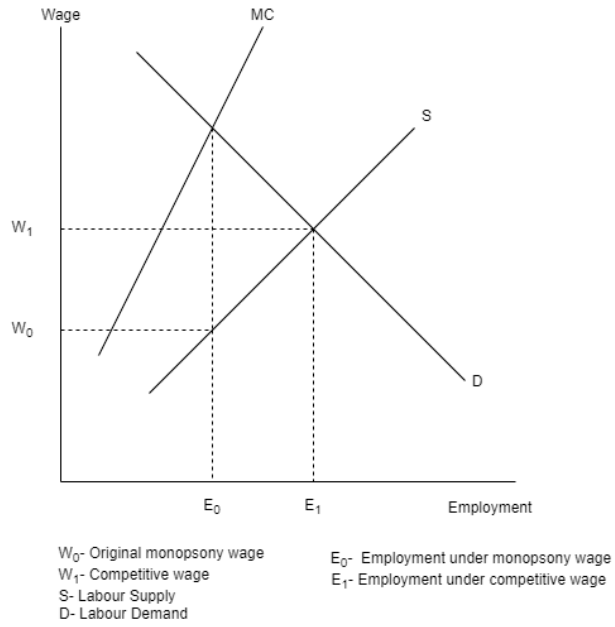
Theory presents three key models that evaluate the employment effects of the minimum wage, the two-sector model, the monopsony, and the neo-classical model. We base the analysis in this study on the theoretical predictions of these three models as the structure of the South African labour market is more or less a hybrid of these. Welch (1974) observed a need to introduce a model that shows the partial coverage of the minimum wage and hence introduced the two-sector model. In this two-sector model, not all firms follow the minimum wage law, some firms choose to comply to the law while others choose not to comply to the law. The model was later expanded by Mincer (1976) to show that the minimum wage can negatively affect employment. Before the minimum wage is introduced, one can observe competitive market wages and full employment (Khamis, 2008). Wages in the covered sector will rise resulting in unemployment once the wage floor has been put in place (Khamis 2008). A proportion of these workers might stay unemployed while some might choose to search for jobs elsewhere in sectors that are not covered by the minimum wage law. This would have a positive effect on the labour supply in the sector that is not covered, leading to a wage fall. Therefore, in this model, when minimum wages rise, wages for individuals in sectors that are covered will increase while wages in sectors which are not covered by will fall.

With respect to employment, the covered sector will experience a fall in employment while the uncovered sector will experience a rise in employment (Khamis, 2008). In the context of

South Africa, the covered sector could be the formal sector of the labour market while the uncovered sector could be the informal sector.

Labour market search models provide some support for deriving labour market theories that are based on a monopsonistic employer. The monopsony power emanates from labour market frictions related to search or frictions emanating from moving from one job to another job (Dickens et al., 1999). Under this model, there is a positive relationship between a minimum wage increase and employment (Dickens et al., 1999). A minimum wage hike leads to a rise in labour productivity thereby also increasing employment.

Figure 1. Minimum Wage under a Monopsony



Source: Brown et al. (1982)

In Figure 1, without a minimum wage, the price of labour supply on every point is lower than the monopsonistic employer's marginal cost (MC). Labour will continue to increase until the point where both MC and demand are the same. Setting a wage floor between W_0 and W_1 will positively affect employment. Once the minimum wage is equal to W_1 further increases will have a negative effect on employment level below the competitive level.

As for the Neo-classical model of competitive markets, it assumes that there is a single labour market with homogeneous workers. The minimum wage is assumed to be binding therefore in this model there is no room for non-compliance and the equilibrium level of employment is driven by forces of demand and supply (Edagbani, 2006). Once the minimum wage has been imposed, employers will respond by reducing the number of workers demanded. The fall in

employment will depend on the firm's ability to replace the now increased price of labour with other inputs (Edagbani, 2006).

Figure 2. Impact of Minimum Wages on Competitive Markets

Source: Neumark (2014)

In Figure 2 we have competitive labour market, where our labour supply curve is positively sloping, and our labour demand curve is negatively sloping. In the absence a wage floor, "w" and "L" are our equilibrium level wage labour employed respectively. Imposing a binding minimum wage at "mw" which is above our equilibrium minimum wage has a negative effect on employment. The new employment with the binding minimum wage is at L_{mw}. The fall in employment is caused by employers substituting away from labour which is now expensive to other inputs such as capital. The new combination of inputs increases costs of production since it is more costly and this leads to a further fall in labour demand.

Based on the discussed theories, the effect of the minimum wage on men and women's labour market outcomes requires a context specific analysis based on relevant data. Some international studies argue that minimum wages cannot be effective in reducing poverty as individuals from poor households are unlikely to be employed (Card & Krueger, 1995). Other studies support the notion that the minimum wage has a dis-employment effect; when minimum wages are increased, many people are likely to lose jobs due to an increase in labour costs (Neumark & Wascher, 2008). The ensuing job loss potentially leads some affected individuals into long-term unemployment and poverty. For those that remain in employment, wages will increase, leading to a rise in their earnings. In this way, setting a minimum wage can have an effect on

employment and wages, but the effect depends on elasticity of labour demand and labour supply and the level of the minimum wage.

Although the minimum wage is meant to raise incomes for the working poor, it can also have distortionary costs which can be more severe among females. In most developing countries, more females than males are concentrated in the informal sector while males are more concentrated in the formal sectors. Therefore, when minimum wage laws are put in place fewer women stand to gain (Menon & Rodgers, 2017). For a minimum wage that negatively affects employment in the formal sector, women may also be less likely to acquire employment in the informal sector (Menon & Rodgers, 2017).

Due to a minimum wage, firms may instead decrease the number of hours of work because in the short run employers may find it less difficult to cut the hours of work instead of the number of employees (Zavodny, 2000). Reducing the number of workers may discourage retained employees, therefore employers may resort to reducing the hours of work in the short run, let natural attrition take its course and then in the long run reduce the number of employees. Consistent with this notion, Neumark and Wascher (2008) show that firms may decide to adjust the working hours for the purpose of offsetting increasing labour costs when responding to a minimum wage change.

SECTION 4. DATA AND METHODOLOGY

This section discusses the data used to evaluate the impact of the national minimum wage on labour market outcomes, the methodology used for the assessment, and also present the descriptive statistics and the empirical findings.

4.1. DATA

This study uses Quarterly Labour Force Surveys (QLFS) data for 2018 and 2019. The data were produced by Statistics South Africa (StatsSA) and sourced from the DataFirst Resource Unit at the University of Cape Town. The datasets are nationally representative and include demographic and labour market information of individuals aged 15 years and above making it appropriate for the current study. The QLFS datasets for 2010 onwards exclude wage data, thus the wage data used in this study were obtained from the Labour Market Dynamics South Africa (LMDSA). The QLFS wage data are released annually in the LMDSA dataset. Using unique identifiers, we were able to match each individual in the LMDSA dataset to the QLFS datasets and then obtain their wage data. All nominal wages were converted into Q1 2019 Rands which is the period directly after the implementation of the national minimum wage, this helps us to make direct comparisons with the national minimum wage of R20 that was implemented in January 2019. To generate real wages for each individual we used Consumer Price Index (CPI) data from StatsSA. StatsSA releases CPI data monthly, thus, to obtain quarterly CPIs the CPI for each month of each quarter is averaged to construct a deflator that was then be used to obtain real wages. For the analysis, we created a panel to follow individuals in periods before and after the introduction of the national minimum wage. The QLFS datasets include a small rotating panel which we make use of in the analysis as in Bhorat et al. (2021). This rotating panel enables us to follow a subset of individuals for up to four periods after they became part of the sample. Hence, our panel includes six waves of the QLFS from Q2 of 2018 to Q3 of 2019. This way, we can follow an individual in the sample for at least one period before and one period after the minimum wage law.

Our sample includes individuals who are aged from 15 to 59 years, an approximation of the working-age population in South Africa. Outliers for wages and hours of work were deleted using the studentised residual test[1]. Sampling weights are used in the analysis to make our results generalisable to the South African population.

[1] The studentised residual test identifies potential outliers that may influence the regression to such an extent that the estimated regression function is pulled towards the potential outlier, deletes the observations one at a time, each time refitting the regression model in the remaining n-1 observations.

4.2. ESTIMATION STRATEGY

The difference-in-differences (DID) estimation method is used to estimate the effects of the introduction of the national minimum wage on labour market outcomes. We carry out separate estimations for men and women following Jia (2014). The approach is appropriate as participation in treatment is not random; individuals covered by the minimum wage policy were not randomly selected. Using simple comparison methods such as the before and after estimator and the cross-sectional estimator in evaluating government interventions would yield biased estimates (Abadie, 2005). The before-after estimator measures the impact of a program by calculating the difference between outcomes of the participants group after the program started with outcomes measured before the program was implemented. This fails to provide a plausible estimate of a program's impact over time. Changes that have nothing to do with the program's impact are mistakenly included as part of a program's effect (Gertler et al., 2016). The cross-section estimator measures a program's impact by comparing outcomes of participants and non-participants after the program. This method has a problem of selection bias as individuals who are in the participants' group may differ in observed characteristics from those in the non-participants' group, and these differences can be included as part of the program (treatment) effect (Gertler et al., 2016).

Abadie (2005) also introduced a procedure of identifying the average treatment effect on the treated which relies on the conditional identifying restriction. Although the method allows multi-level treatment variables, covariates are treated non-parametrically to avoid inconsistencies that may be caused by functional form misspecifications. However, to obtain interpretable results the number of covariates should be very large. We also note that the triple DID estimator does not apply to our study due to the experimental setup (Angrist & Pischke, 2008). The triple DID estimator applies where there is more than one set of control groups but in our case, we only have one control group, high-wage men, or women (Imbens & Wooldridge, 2007). The national minimum wage does not allow us to exploit any other control groups based on non-covered regions or demographic groups.

To separate the effects of the national minimum wage policy on labour market outcomes from other events that may have taken place concurrently with the national minimum wage policy the DID method is used. The DID measures the impact of the minimum wage by calculating the difference in the pre-law (2018) and post-law (2019) variations in outcomes between the treated group and an untreated comparison group. The DID estimator considers any differences between the treated and untreated groups that remain unchanged over time (Angrist & Pischke,

2008). This method nets out the general time trend by making comparisons across groups and also eliminates the group fixed effects by making comparisons over time within a group (Angrist & Pischke, 2008). The treatment group consists of females/males who work for pay and were earning below the minimum wage in Q4 of 2018, the quarter preceding the national minimum wage law. The comparison group is restricted to women/men from all sectors who earn between 10 percent and 50 percent above the minimum wage, hence are uncovered by the national minimum wage (Bhorat et al., 2021). Individual characteristics of workers are used to create a comparison group which resembles the treatment group as in Bhorat et al., (2021). This comparison group informs us of what could have potentially taken place if the policy was not introduced to the treatment group.

We adapt the Card and Krueger (1994) estimation strategy with the following specifications:

To answer the first, second, and third research questions we use equations (1), (2), and 3 respectively. These are estimated separately for males and females and the results would be analysed in a comparative context, see Jia (2014).

$$E_{it} = \beta_0 + \beta_1 M_t + \beta_2 D_i + \theta M_t D_i + X_{it} + \varepsilon_{it} \quad (1)$$

$$Log(W_{it}) = \beta_0 + \beta_1 M_t + \beta_2 D_i + \theta M_t D_i + X_{it} + \varepsilon_{it} \quad (2)$$

$$H_{it} = \beta_0 + \beta_1 M_t + \beta_2 D_i + \theta M_t D_i + X_{it} + \varepsilon_{it} \quad (3)$$

E_{it} in equation (1) denotes the employment status for individual i at time t.

In equation (2) $Log\ (W_{it})$ represents log real hourly wage for individual i at time t.

H_{it} in equation (3) stands for weekly hours of work by worker i at time t.

M_t is a dummy variable for time, equal 1 for year 2019 (after the national minimum wage law became effective) and 0 for year 2018 (before the national minimum wage law).

D_i is the treatment dummy, it takes the value of 1 for females/males who earn below the minimum wage in the pre-treatment period (the treatment group) and takes the value of 0 for women/men who earn between 10 percent and 50 percent above the minimum wage.

$M_t D_i$ is the interaction term which captures the average treatment effect. It tells us whether the changes that are observed overtime are also observed for individuals in similar groups or not, who the policy is inapplicable to. This is to confirm whether the results observed are not due to an economic wide shock.

θ is our parameter of interest, the true causal of the treatment.

X_{it} is a vector of individual-level independent variables including age, race, educational attainment, marital status, and industry of employment.

The key assumption for the DID estimator is that the θ will not be different from zero without treatment. Basically, in the absence of treatment, we assume a parallel trend in the outcome variable between the treatment and control group.

In equation (1), to evaluate the effect of the minimum wage on employment we need to follow the same person in the period before and after the minimum wage policy. Thus, we follow females/males in the treatment group over two time periods to observe whether due to the minimum wage policy they become unemployed. Our sample includes individuals who were employed in the Q4 of 2018 so that we can observe whether the same person did not become unemployed after the law was initiated. The longitudinal panel created from the QLFS will enable us to observe these changes and thus our samples will include both employed and unemployed females/males. To investigate the effect of the minimum wage on wages and hours of work in equations (2) and (3) we calculate changes in wages and hours of work for the treatment group in the pre- and post-national minimum wage policy periods and subtract from changes in wages and hours worked of the control group over the same two periods. Therefore, our sample for equations (2) and (3) consists of employed females/males.

Table 1 below shows the variables that are included in the analysis.

Table 1. Description of variables

Variable Name	Description
Dependent Variables	
Employment	Dummy variable =1 if the female/male is employed in 2018Q4 and stays employed in 2019 and 0 if the female/male is employed in 2018Q4 but becomes unemployed in 2019.
Wages	Is a dependent variable that represents an individual's log of real hourly wage. Derived from converting individual earnings and hours worked into monthly frequency, and then calculating the ratio of monthly wages/ monthly hours worked. The wages are adjusted for inflation using the 2019Q1 CPI from StatsSA.
Hours of work	Is a dependent variable that represents an individual's usual weekly hours of work.
Independent Variables	
Time	Dummy variable =1 for year 2019 (after the national minimum wage law became effective) and 0 for year 2018.

Age	Age is a set of five dummy variables in the following ranges: 15-19, 20-29, 30-39, and 40-49 and 50-59 years.
Education level	A set of 5 dummy variables that represent a female/ male's educational attainment: No schooling, Primary, Incomplete Secondary, Matric/Secondary, and Tertiary education
Marital status	A set of 3 dummy variables that represent a female/male's marital status: single/never married, married/living together like husband and wife, and divorced/separated/widowed
Race	Dummy variables taking the value of 1 if a female/male is black African and 0 otherwise (White, Asian, or Coloured)
Rural versus urban	Dummy variable equals 1 if the female/male resides in an urban area and 0 otherwise
Industry	10 dummy variables for the industry of employment[2].

4.3. DESCRIPTIVE STATISTICS

In this section, we use a combination of descriptive statistics and kernel density functions to discuss whether there were changes in the labour market indicators over time. Table 2 provides a basic overview of employment and wages in the QLFS sample under study. This shows both weighted and unweighted totals from Q2 of 2018 to Q3 of 2019.

Table 2. Quarterly Labour Force Survey Data Overview 2018Q2-2019Q3

	Before NMW-2018			After NMW-2019		
Quarter	Q2	Q3	Q4	Q1	Q2	Q3
Total employed (unweighted)	17 462	17 438	17 373	16 956	16 840	17 008
Total employed (weighted)	15 832 153	15 939 217	16 077 120	15 860 462	15 846 410	15 892 405
Total wage earners (unweighted)	12 131	12 042	12 003	11 617	11 459	11 597
Total wage earners (weighted)	10 911 770	10 894 099	11 013 770	10 792 156	10 668 924	10 733 584

[2] The 10 industries of employment are: agriculture, mining, manufacturing, utilities, construction, wholesale and retail trade, transport, financial services, community-based work and private households industries.

Total min-wage earners (weighted)	5 397 869	5 258 678	5 221 697	4 979 483	4 906 916	4 861 472

Source: Own calculations based on StatsSA (QLFS, 2018Q2-2019Q3)

During the 2018Q2 to 2019Q3 period, total employment in South Africa ranged between 15.832 million and 15.892 million workers. In 2018Q2 and 2018Q3 it was just below 16 million, however, in 2018Q4 it increased just above 16 million and then reverted below 16 million in 2019Q1-Q3. Total number of wage earners in South Africa ranged between 10.669 million and 11.014 million workers over the given period. The temporal changes seem to follow a similar trend to that of the total number of people employed. Table 2 also shows that the total number of minimum wage earners is stable at around 5 million in the pre-minimum wage period, however, in the post-minimum wage period, it hovered below 5 million across all quarters. This could be an indication of the minimum wage legislation impact.

In Table 3 we present some descriptive statistics of individual characteristics that may affect wages, employment, and hours of work for the overall sample of analysis. Notably, this excludes individuals who do not meet the criteria for our treated and control groups. The summary statistics outline the average characteristics (or proportions) of the treatment group (T) and the control group (C) during pre- and post-treatment periods, i.e., before matching on observable characteristics. We note that figures that are emboldened highlight that the mean/ proportion of the variable is statistically different between the T and C group in a given quarter, as shown by p-values following a t-test.

Table 3. Descriptive Statistics of Individuals, 2018Q2-2019Q3

PRE-TREATMENT PERIOD (2018)							**POST-TREATMENT PERIOD (2019)**					
Time	Q2		Q3		Q4		Q1		Q2		Q3	
	C	T	C	T	C	T	C	T	C	T	C	T
Observations	1213	6211	1259	5974	1274	5896	1282	5523	1294	5455	1375	5402
Hours of work	***41.44***	***43.63***	***41.57***	***43.69***	***41.49***	***43.54***	***41.59***	***43.40***	***41.40***	***43.43***	***41.82***	***43.63***
Real hourly wage	***26.23***	***12.25***	***25.99***	***12.19***	***25.82***	***12.21***	***23.23***	***11.01***	***25.18***	***11.94***	***25.03***	***11.99***
Nominal hourly wage	***25.54***	***11.64***	***25.61***	***11.73***	***25.70***	***11.78***	***25.60***	***11.75***	***25.59***	***11.71***	***25.68***	***11.90***
Educational Level												
Primary	***0.085***	***0.161***	***0.096***	***0.157***	***0.109***	***0.153***	***0.082***	***0.157***	***0.101***	***0.150***	***0.085***	***0.154***
Inc. Secondary	***0.391***	***0.438***	***0.399***	***0.457***	***0.417***	***0.454***	***0.409***	***0.440***	***0.391***	***0.441***	***0.391***	***0.441***
Matric	***0.387***	***0.287***	***0.379***	***0.274***	***0.338***	***0.285***	***0.372***	***0.285***	***0.374***	***0.278***	***0.383***	***0.277***
Tertiary	***0.122***	***0.086***	***0.130***	***0.095***	***0.119***	***0.082***	***0.117***	***0.091***	***0.122***	***0.100***	***0.129***	***0.096***
Age categories (Years)												

20-29	***0.205***	***0.237***	0.239	0.241	0.230	0.239	0.229	0.227	0.233	0.236	0.241	0.227
30-39	0.356	0.336	0.346	0.334	0.334	0.336	0.349	0.340	0.352	0.329	0.337	0.332
40-49	0.278	0.261	0.253	0.258	0.259	0.255	0.240	0.254	0.245	0.252	0.255	0.261
50-59	0.157	0.158	0.153	0.158	0.170	0.159	0.172	0.167	0.165	0.175	0.164	0.172
Marital status												
married/living together	***0.466***	***0.394***	***0.453***	***0.392***	***0.462***	***0.383***	***0.438***	***0.394***	***0.455***	***0.395***	***0.461***	***0.399***
divorced/separated	***0.053***	***0.066***	***0.044***	***0.064***	***0.053***	***0.067***	0.055	0.066	***0.047***	***0.065***	***0.048***	***0.066***
Race												
Black African	***0.845***	***0.873***	***0.851***	***0.872***	***0.841***	***0.876***	***0.835***	***0.873***	***0.849***	***0.879***	***0.841***	***0.875***
Rural vs Urban												
urban areas	***0.832***	***0.673***	***0.812***	***0.649***	***0.812***	***0.653***	***0.819***	***0.658***	***0.801***	***0.658***	***0.813***	***0.652***
Industry												
Mining	0.018	0.014	0.014	0.012	0.020	0.017	0.020	0.014	0.016	0.014	0.019	0.016
Manufacturing	***0.118***	***0.088***	***0.119***	***0.086***	***0.121***	***0.087***	***0.131***	***0.085***	***0.107***	***0.087***	***0.116***	***0.082***
Utilities	0.006	0.005	***0.009***	***0.005***	0.004	0.004	0.006	0.005	0.006	0.004	***0.008***	***0.005***
Construction	***0.099***	***0.077***	***0.098***	***0.079***	***0.101***	***0.078***	0.078	0.073	0.083	0.071	0.082	0.069
Wholesale and retail trade	***0.246***	***0.162***	***0.230***	***0.162***	***0.204***	***0.159***	***0.234***	***0.158***	***0.226***	***0.164***	***0.247***	***0.160***
Transport	0.045	0.050	0.051	0.051	0.053	0.047	0.050	0.049	0.048	0.049	0.047	0.050
Financial services	0.137	0.123	***0.155***	***0.126***	***0.155***	***0.134***	***0.148***	***0.131***	***0.173***	***0.121***	***0.165***	***0.118***
Community; social and personal services	***0.154***	***0.205***	***0.152***	***0.201***	***0.170***	***0.194***	***0.158***	***0.200***	***0.169***	***0.218***	***0.154***	***0.216***
Private households	***0.31***	***0.167***	***0.119***	***0.167***	***0.126***	***0.167***	***0.128***	***0.175***	***0.127***	***0.165***	***0.119***	***0.177***

Source: Own calculations based on StatsSA (QLFS, 2018Q2-2019Q3)[3]
Notes: The emboldened figures are statistically different between the treatment and control groups at either 10%, 5% or 1% level.

Table 3 shows that for all quarters, the treatment group has a larger sample size than the control group. This is partly due to the wage cut-offs that we used to distinguish the two groups of workers. In the period before treatment is carried out, the control group has 1213, 1259, and 1274 individuals for 2018Q2, 2018Q3, and 2018Q4 respectively. This increased in the post-treatment period, to 1282 (2019Q1), 1294 (2019Q2), and 1375 (2019Q3). For the treatment group, there are 6211, 5974, and 5896 individuals in 2018Q2, 2018Q3, and 2018Q4 respectively. This falls to 5523 in 2019Q1, 5455 in 2019Q2 and 5402 in 2019Q3. The decreasing sample size of the treatment group in the post-treatment period is in line with the

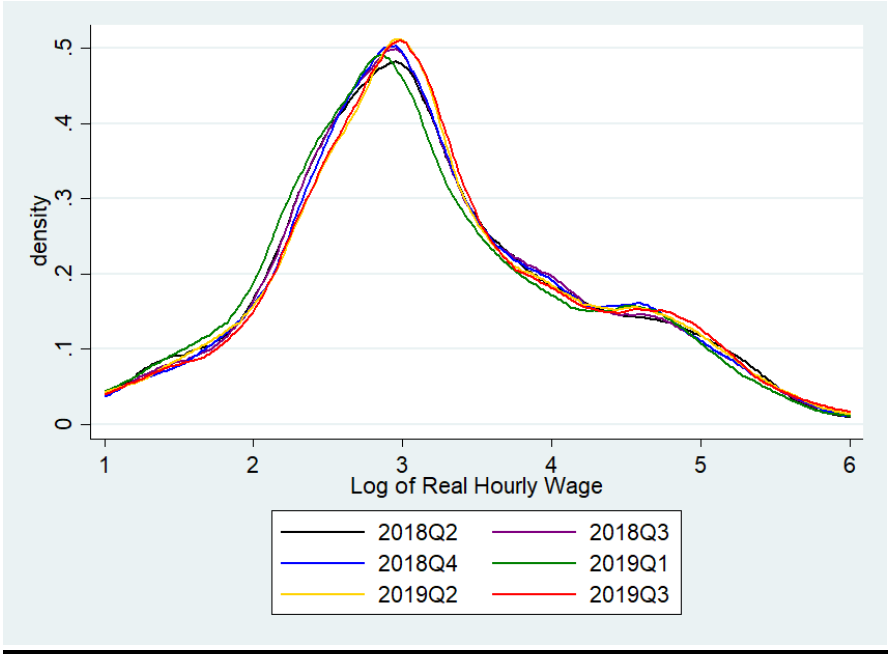
[3] Base categories: age category 15-19, individuals with no education, individuals who are single/never married, individuals who are white/coloured/Asian, rural areas, and agricultural industry.

above-mentioned overall decline in the number of workers who are eligible for the minimum wage during that period.

There are statistically significant differences in average weekly hours of work for the covered and uncovered employees in the periods before and after treatment is carried out. The average number of weekly hours of work is greater for individuals who are covered by the national minimum wage (approximately 43 hours), compared to those who are not covered by the national minimum wage (approximately 42 hours) in the pre- and post-treatment period.

As expected, Table 3 also shows that there are statistically significant differences in the mean real hourly wage for the control and treatment groups. In the pre-treatment periods, the average real hourly wage for the control group is steady at around R26.00 while that of the treatment group is steady at around R12.00. These wages slightly declined in the post-treatment periods. To analyse whether there have been changes in the wage distribution due to the national minimum wage policy we use graphs for the kernel density function. Figure 3 shows the kernel density function for the pooled distribution of wages for males and females for 2018Q2 - 2019Q3. From the distribution we can observe that across the quarterly density distributions there is a common peak. An effective national minimum wage hike would result in a noticeable right-ward shift in the distribution for wages in the post treatment periods. However, we observe that changes in the overall wage distribution between the pre-and post-minimum wage periods were not significant. This conclusion also applies to kernel density functions that are specific to men and women see Appendix 1. Therefore, our analysis will delve into whether there were any significant differences in wages between the treatment and control groups over time.

Figure 3. Kernel Density for Log Real Hourly Wage, 2018q2-2019q3



Source: Own calculations based on StatsSA (QLFS, 2018Q2-2019Q3), real values reflected in 2019Q1 constant prices, estimates are weighted.

For educational attainment, Table 3 shows that generally the control group has a higher proportion of workers with matric and tertiary education than the treatment group, while the opposite applies to the proportion of workers with incomplete secondary education and below. This suggests that employees who are covered by the minimum wage have a lower educational attainment compared to those who are not. Further, the age distribution of workers in the two groups is mostly statistically similar across all quarters in the pre- and post-treatment periods.

For the marital status variable, generally the proportion of individuals who are divorced or separated is less than that of individuals who are married or cohabitating in the period before and after the national minimum wage policy is introduced. Also, the proportion of married or cohabiting individuals is higher for the control (46%) relative to the treatment group (39%). To some extent, this indicates that individuals in the control group have a more stable family background than those in the treatment group.

For our race dummy variable, the proportion of black South Africans in the control group is lower than in the treatment (87%) compared (84%) in the periods before and after the national minimum wage policy is carried out. The control group (81%) also has a significantly higher proportion of workers who reside in urban rather than rural areas relative to the treatment group (65%).

For the industry of employment, differences in the means of the control and treatment groups for individuals in the manufacturing, wholesale and retail, community; social and personal services work, and private households industries are statistically significant in the pre-law and post-law periods. Statistically significant differences in means are also observed in the utilities industry in 2018Q3 and 2019Q3, construction industry in all the pre-treatment periods, and the financial service industry from 2018Q3 to 2019Q3. Overall, these statistics suggest that the characteristics of individuals in treatment group are statistically different from characteristics of individuals in the control group which motivates for matching individuals in our DID analysis.

Table 4. Descriptive Statistics of Individual Statistics, 2018q2-2019q3 By Gender (Weighted)

BEFORE TREATMENT PERIOD							**AFTER TREATMENT PERIOD**					
Time	2018Q2		2018Q3		2018Q4		2019Q1		2019Q2		2019Q3	
	C	T	C	T	C	T	C	T	C	T	C	T
Observations: F	551	2950	553	3155	567	3096	599	2926	571	2870	630	2836
Observations: M	662	2786	706	2819	707	2800	683	2597	723	2585	745	2566
Hours of work: F	***38.71***	***41.16***	***38.46***	***40.98***	***38.59***	***41.09***	***38.92***	***40.87***	***38.99***	***40.99***	***39.78***	***41.22***
Hours of work: M	***43.70***	***47.13***	***43.98***	***47.55***	***43.97***	***46.89***	***44.56***	***46.74***	***43.76***	***46.90***	*44.03*	*47.12*
Real hourly wage: F	***26.25***	***12.19***	***25.96***	***12.20***	***25.87***	***12.13***	***23.28***	***10.90***	***25.18***	***11.78***	***25.04***	***11.86***
Real hourly Wage: M	***26.16***	***12.36***	***25.94***	***12.24***	***25.73***	***12.37***	***23.15***	***11.10***	***25.25***	***12.19***	***25.03***	***12.20***
Educational attainment												
Primary: F	***0.060***	***0.142***	***0.086***	***0.141***	***0.092***	***0.138***	***0.059***	***0.140***	***0.092***	***0.129***	***0.079***	***0.144***
Primary: M	***0.100***	***0.150***	0.097	0.159	***0.118***	***0.148***	***0.092***	***0.155***	**0.107**	**0.155**	***0.086***	***0.151***
Inc. Secondary: F	***0.347***	***0.433***	***0.346***	***0.452***	***0.343***	***0.444***	***0.358***	***0.436***	***0.337***	***0.433***	***0.315***	***0.436***
Inc. Secondary: M	0.405	0.431	0.428	0.444	0.452	0.450	0.438	0.432	0.416	0.438	0.425	0.427
Matric: F	***0.414***	***0.297***	***0.409***	***0.276***	***0.385***	***0.298***	***0.419***	***0.290***	***0.402***	***0.290***	***0.434***	***0.279***
Matric: M	***0.379***	***0.303***	***0.371***	***0.289***	0.316	0.294	***0.361***	***0.298***	***0.357***	***0.289***	***0.353***	***0.302***
Tertiary: F	0.164	0.102	***0.143***	***0.104***	***0.158***	***0.090***	***0.148***	***0.104***	***0.161***	***0.118***	***0.155***	***0.108***
Tertiary: M	0.102	0.091	0.085	0.087	0.098	0.087	0.094	0.092	***0.109***	***0.090***	***0.127***	***0.093***
Age categories (Years)												
20-29: F	0.198	0.203	0.205	0.211	0.223	0.215	0.217	0.214	0.214	0.216	***0.243***	***0.194***
20-29: M	***0.212***	***0.294***	0.268	0.294	***0.236***	***0.280***	0.243	0.265	0.238	0.271	0.232	0.272

30-39: F	0.335	0.332	0.333	0.322	0.323	0.323	0.339	0.333	0.334	0.329	0.305	0.332
30-39: M	0.364	0.347	0.353	0.345	0.337	0.345	0.371	0.345	***0.376***	***0.339***	0.363	0.343
40-49: F	*0.302*	*0.304*	0.298	0.304	0.283	0.299	0.264	0.290	0.264	0.279	***0.269***	***0.298***
40-49: M	***0.282***	***0.230***	0.245	0.232	0.269	0.236	0.237	0.248	0.252	0.249	0.293	0.251
50-59: F	0.160	0.156	0.153	0.156	0.164	0.155	0.171	0.157	0.184	0.170	0.179	0.170
50-59: M	0.140	0.120	0.127	0.120	***0.151***	***0.126***	0.135	0.130	0.127	0.129	0.108	0.123
Marital status												
Married/Living together: F	***0.442***	***0.379***	0.423	0.381	***0.426***	***0.364***	0.417	0.373	***0.423***	***0.382***	***0.435***	***0.392***
Married/Living together: M	***0.525***	***0.436***	***0.506***	***0.437***	***0.534***	***0.440***	***0.483***	***0.448***	***0.513***	***0.449***	***0.515***	***0.440***
Divorced/ Separated: F	***0.063***	***0.083***	***0.058***	***0.082***	***0.061***	***0.087***	***0.064***	***0.089***	0.070	0.080	0.072	0.086
Divorced/ Separated: M	0.035	0.026	0.027	0.028	0.036	0.026	0.036	0.026	***0.019***	***0.036***	0.022	0.028
Race												
Black: F	***0.827***	***0.873***	***0.836***	***0.872***	***0.841***	***0.877***	***0.818***	***0.849***	***0.825***	***0.879***	***0.817***	***0.873***
Black: M	0.842	0.862	0.851	0.851	***0.829***	***0.856***	0.834	0.850	0.847	0.860	0.844	0.861
Residence												
Urban areas: F	***0.846***	***0.671***	***0.823***	***0.666***	***0.829***	***0.649***	***0.845***	***0.653***	***0.815***	***0.653***	***0.835***	***0.648***
Urban areas: M	***0.813***	***0.673***	***0.805***	***0.659***	***0.807***	***0.669***	***0.790***	***0.669***	***0.781***	***0.671***	***0.793***	***0.663***
Industry												
Mining: F	***0.013***	***0.005***	0.006	0.004	***0.011***	***0.006***	0.010	0.005	0.004	0.006	0.008	0.006
Mining: M	0.021	0.027	0.018	0.022	0.024	0.033	0.029	0.028	0.018	0.024	0.027	0.026
Manufacturing: F	***0.090***	***0.062***	***0.091***	***0.067***	***0.106***	***0.067***	***0.112***	***0.069***	0.078	0.072	***0.096***	***0.068***
Manufacturing: M	0.136	0.122	***0.141***	***0.117***	0.131	0.114	***0.147***	***0.112***	*0.134*	*0.113*	**0.139**	**0.101**
Utilities: F	0.006	0.000	0.000	0.004	0.000	0.004	0.006	0.004	0.003	0.004	0.006	0.002
Utilities: M	0.006	0.008	**0.012**	**0.006**	0.007	0.005	0.011	0.006	0.013	0.005	0.012	0.006
Construction: F	***0.019***	***0.031***	***0.016***	***0.029***	***0.012***	***0.031***	***0.014***	***0.031***	0.012	0.028	***0.018***	***0.032***
Construction: M	***0.172***	***0.131***	***0.166***	***0.134***	***0.173***	***0.130***	0.141	0.119	0.140	0.116	***0.129***	***0.109***
Wholesale and retail trade: F	***0.251***	***0.177***	***0.246***	***0.172***	***0.220***	***0.158***	***0.258***	***0.162***	***0.247***	***0.178***	***0.290***	***0.162***
Wholesale and retail trade: M	***0.226***	***0.154***	***0.208***	***0.153***	0.179	0.165	***0.215***	***0.156***	0.213	0.161	***0.214***	***0.162***
Transport: F	0.019	0.015	0.024	0.016	***0.025***	***0.014***	0.019	0.015	***0.022***	***0.015***	***0.034***	***0.014***
Transport: M	***0.069***	***0.094***	0.079	0.097	0.084	0.091	0.076	0.093	0.072	0.089	***0.062***	***0.092***
Financial services: F	***0.131***	***0.108***	***0.146***	***0.105***	0.139	0.123	0.116	0.109	***0.164***	***0.103***	***0.138***	***0.106***
Financial services: M	0.149	0.150	0.160	0.159	0.166	0.157	0.176	0.157	0.175	0.148	***0.183***	***0.150***
Community, social…: F	***0.224***	***0.272***	***0.218***	***0.269***	0.242	0.256	***0.232***	***0.258***	***0.244***	***0.271***	***0.210***	***0.272***

Community, social…: M	0.111	0.118	0.105	0.111	0.124	0.112	0.098	0.119	***0.113***	***0.132***	***0.115***	***0.140***
Private households: F	0.228	0.248	***0.212***	***0.253***	***0.223***	***0.255***	***0.208***	***0.264***	***0.214***	***0.249***	***0.185***	***0.263***
Private households: M	0.047	0.064	***0.049***	***0.059***	0.051	0.061	***0.047***	***0.068***	0.052	0.060	***0.049***	***0.069***

Source: Own calculations based on StatsSA (QLFS, 2018Q2-2019Q3). Notes: F denotes Females, M denotes Males. C=control group, T= treatment group. Figures in bold show that the mean/proportion of a variable is statistically different between the treatment and control group for a specific sex in a given period. The emboldened figures are statistically different by gender between the treatment and control groups at either 10%, 5% or 1% level.

Table 4 presents the descriptive statistics of individual characteristics by gender and according to treatment and control groups, in pre-and post-national minimum wage policy periods. The number of females in the treatment group is greater than that of males in all the pre- and post-treatment periods. The total number of females ranges from 2926 to 3155, while that of males ranges from 2566 to 2819. In the control group, the number of males is greater than that of females in all the pre-and post-treatment periods. We can also observe that average weekly hours of work are generally higher for males compared to females. The real hourly wage is usually higher for the control relative to the treated group. Males who are covered by the minimum wage have a higher real hourly wage than their female counterparts while the opposite applies to the control group, irrespective of time period.

For educational attainment, we observe that in most cases the control group has a higher proportion of workers who are endowed with relatively higher levels of education than the treatment group, regardless of gender and time period. Similar to the pooled sample, the age distribution by gender does not show much statistical difference between the treatment and control groups in the pre-and post- national minimum wage periods.

As for marital status, the proportion of males and females who are married or living together as husband and wife is higher than that of males than females who are divorced/separated or widowed in the pre-and post-treatment periods. While the control group mostly has a higher proportion of married individuals than the treatment group, men in the control group have a higher proportion of married individuals than their female counterparts. If the marital wage premium applies, this partly explains why men on average earn more than women in South Africa (Casale and Posel, 2010). Besides, the proportion of black South African males and females is very high relative to other racial groups, at above 80% in the treatment group as well as the control group in the pre-and post-treatment periods.

Considering the distribution of workers by industry of employment, in the wholesale and retail trade, community; social and personal services and private households industry, the proportion of workers is generally higher for females compared to males. For the mining, manufacturing, construction, transport and financial services industries, the proportion of workers is higher for males compared to females in the pre-and post-treatment periods. Since the industries have different pay structures, these differences in the distribution of male and female workers could partly explain the gender wage differential.

To ensure that the treatment and control groups to be used in our DID analysis have similar characteristics before the national minimum wage comes into effect we apply propensity score matching based on the kernel matching technique. The results are shown in Table 5 below.

Table 5. Two Sample T-Test for The Treatment and Control Group (weighted)

	pooled model			Females			**Males**		
Variables	Mean:C	Mean:T	Diff.	Mean:C	Mean:T	Diff.	Mean:C	Mean:T	Diff.
Educational attainment									
Primary	0.140	0.152	0.012	0.129	0.149	**0.021**	0.146	0.156	0.009
Inc. Secondary	0.449	0.454	0.006	0.464	0.449	-0.014	0.444	0.460	0.016
Matric	0.296	0.285	-0.011	0.284	0.285	0.001	0.304	0.285	-0.020
Tertiary	0.094	0.081	**-0.012**	0.099	0.084	-0.015	0.091	0.078	-0.013
Age categories									
20-29	0.227	0.238	0.012	0.186	0.201	0.015	0.263	0.280	0.017
30-39	0.340	0.337	-0.003	0.326	0.329	0.003	0.356	0.345	-0.011
40-49	0.266	0.255	-0.011	0.307	0.281	**-0.027**	0.232	0.227	-0.005
50-59	0.159	0.159	0.000	0.173	0.182	0.008	0.142	0.135	-0.007
Marital Status									
Married/Living together	0.401	0.383	-0.017	0.329	0.336	0.007	0.467	0.436	**-0.031**
Divorced/Separated	0.066	0.066	0.001	0.095	0.099	0.004	0.032	0.030	-0.002
Race									
Black	0.873	0.876	0.003	0.881	0.885	0.005	0.867	0.866	-0.001
Residence									
Urban	0.659	0.654	-0.006	0.649	0.643	-0.005	0.672	0.665	-0.007
Industry									
Mining	0.024	0.016	**-0.008**	0.010	0.005	**-0.005**	0.036	0.030	-0.007
Manufacturing	0.097	0.087	-0.010	0.077	0.064	-0.013	0.119	0.113	-0.006
Utilities	0.005	0.004	-0.001	0.000	0.003	**0.003**	0.005	0.005	0.000
Construction	0.083	0.078	-0.005	0.020	0.032	**0.012**	0.135	0.130	-0.006
Wholesale and retail trade	0.165	0.160	-0.006	0.161	0.154	-0.007	0.166	0.167	-0.001
Transport	0.049	0.047	-0.002	0.015	0.012	-0.003	0.082	0.086	0.004
Financial services	0.144	0.135	-0.009	0.129	0.118	-0.011	0.165	0.154	-0.011
Community; social…	0.186	0.194	0.007	0.289	0.266	-0.023	0.111	0.114	0.003
Private Households	0.145	0.168	**0.022**	0.230	0.262	**0.032**	0.055	0.063	0.009
Observations	1274	5912	7186	567	3105	3745	707	2807	3514

Source: Own calculations based on StatsSA (QLFS, 2018Q4)[4]
Note: the emboldened figures are significant at 10%, 5%, or 1%.

Table 5 shows that in most cases the covariate balancing property is satisfied at conventional levels of significance (either 10%, 5% or 1%). However, there are a few emboldened cases of concern where the property is violated. For the overall/pooled sample this applies to tertiary education, mining, and private households industries. For the female sample there are statistically significant difference in the means of the control and treatment groups for primary education, age group 40-49, mining, manufacturing, utilities, and construction industries. This also extends to marital status in the case of males. While we are aware of these shortfalls of our data, we currently do not have alternative datasets to pursue. Hence our results should be interpreted as being indicative rather than absolute.

To detect whether there is a pre-existing parallel trend of the outcome for the treated and control groups we carry out a graphical illustration parallel trend test as shown in the APPENDIX. Results indicate that there is a parallel trend between the control and treatment group before the national minimum wage policy was carried out.

Mean: C is the mean control group, Mean: T is the mean for the treatment group and Diff. is the difference between means of the control and treatment group [Diff = (Mean: T) – (Mean: C)]. The highlighted coefficients in the Diff. columns indicates that there are statistically significant differences in the means of the control and treatment group at conventional levels of significance.

SECTION 5. DISCUSSION OF RESULTS

In this section, we discuss the results of the effect of the minimum wage on wages, hours of work, and employment using the specifications outlined in the methodology section.

5.1. WAGE EFFECT

Table 6 presents results for our pooled model which show how the minimum wage policy affects wages. The models were estimated with and without covariates to assess the robustness of the findings. The full set of results is in Appendix 3.

Table 6. Estimates Of the Minimum Wage effect on Wages for the Pooled Sample (Weighted)

VARIABLES	LOGWAGES	LOGWAGES
Mean control t(0)	3.246	3.399
Mean treated t(0)	2.363	2.529
Diff t(0)	-0.883*** (0.001)	-0.870*** (0.001)
Mean control t(1)	3.217	3.369
Mean treated t(1)	2.348	2.519
Diff t(1)	-0.869*** (0.001)	-0.849*** (0.001)
Diff-in-Diff	0.014*** (0.017)	0.020*** (0.001)
Covariates	N	Y
Observations: before : after R-squared	7186 6780 0.29	
robust standard errors in parenthesis *** *p<0.01*, ** *p<0.05*, * *p<0.1*		

Source: Own calculations based on StatsSA(QLFS, 2018-2019)
Notes: t(0) = before treatment period, t(1)= post-treatment period. The specification for the models with covariates include demographic, and labour market controls. The full regression output is in Appendix 3.

The R-squared shows that 29% of the changes in our log of real hourly wage variable are explained by the independent variables. From the estimates, we observe that the coefficient on the *Diff t(0)* variable is statistically significant, meaning there are differences in average wages for the control and treatment groups in the pre-treatment period. The coefficient on *Diff t(1)* is also significant, meaning on average, there are differences in wages for the control and treatment groups in the post-treatment period. The coefficient on the *Diff-in-Diff* variable which captures the average treatment effect of the treated is statistically significant with the treatment

having a positive effect on wages. Particularly, the results suggest that on average wages for the treated group increased by 1.4% - 2% compared to wages for the control group in the period after the minimum wage policy. Although quantitatively different, this result harmonises with (Bhorat et al., 2021).

Table 7. Estimates Of the Minimum Wage effect on Wages by Gender (Weighted)

VARIABLES	**LOGWAGES- females**		**LOGWAGES- males**	
Mean control t(0)	3.250	3.337	3.244	3.422
Mean treated t(0)	2.369	2.482	2.358	2.546
Diff t(0)	-0.881*** (0.001)	-0.855*** (0.001)	-0.886*** (0.001)	-0.876*** (0.001)
Mean control t(1)	3.217	3.307	3.216	3.393
Mean treated t(1)	2.344	2.463	2.353	2.544
Diff t(1)	-0.873*** (0.001)	-0.844*** (0.001)	-0.864*** (0.001)	-0.849*** (0.001)
Diff-in-Diff	0.007*** (0.001)	0.010*** (0.001)	0.022*** (0.002)	0.028*** (0.001)
Covariates	N	Y	N	Y
Observations: before : after R-squared	3672 3467 0.33		3514 3313 0.31	
robust standard errors in parenthesis **** p<0.01, **p<0.05, *p<0.1*				

Source: Own calculations based on StatsSA(QLFS, 2018-2019)[5]

Mean: C is the mean control group, Mean: T is the mean for the treatment group and Diff. is the difference between means of the control and treatment group [Diff = (Mean: C) – (Mean: T)]. The highlighted coefficients in the Diff. columns indicates that there are statistically significant differences in the means of the control and treatment group.

Table 7 shows results of the minimum wage effect for males and females separately. This enables us to investigate whether the effect of the national minimum wage on wages differs by gender. From the estimates, we observe that the coefficient on the *Diff t(0)* is statistically significant for both genders which shows that on average there are significant differences between wages of the control and treatment groups in the pre-treatment period. This conclusion also applies for both genders in the post-treatment period, as shown by the coefficient for *Diff t(1)*. For females the coefficient on the *Diff-in-Diff* variable is statistically significant and positive, indicating that the national minimum wage had a positive effect on wages for females. On average wages for women in the treated group increased by 1% in the post-minimum wage period relative to wages for women in the control group. For males we also observe a positive and statistically significant coefficient for the *Diff-in-Diff* variable. Notably, wages for men covered by the minimum wage policy increased by a relatively larger percentage (2.8%) in the post- treatment period when compared to wages for their female counterparts.

5.2. EFFECT ON HOURS OF WORK

In this section we analyse the effect of the national minimum wage on hours of work to discuss how employers might have responded by changing the number of working hours they demanded from their employees.

Table 8. Estimates Of the Minimum Wage Effect on Hours of Work for the Pooled Model (Weighted)

VARIABLES	**Hours of work**	**Hours of work**
Mean control t(0)	41.724	59.847
Mean treated t(0)	44.142	60.675
Diff t(0)	2.418 *** (0.014)	0.827 *** (0.013)
Mean control t(1)	42.059	49.695
Mean treated t(1)	43.933	60.381
Diff t(1)	1.874*** (0.014)	0.685 *** (0.013)
Diff-in-Diff	-0.545 *** (0.019)	-0.142 * (0.017)
Covariates	N	Y
Observations: before : after R-squared	7366 6993 0.19	
robust standard errors in parenthesis **** p<0.01, **p<0.05, *p<0.1*		

Source: Own calculations based on StatsSA(QLFS, 2018-2019)

Notes: The specification in column 3 include demographic, and labour market controls. The full regression output is in the Appendix 4.

Table 8 presents results for the effect of the national minimum wage on hours of work for the pooled sample of males and females. The coefficient on the *Diff t(0)* is statistically significant and positive, indicating that the average weekly hours of work are greater for the control group compared to the treatment group in the pre-treatment period. In the post-treatment period, the coefficient on the *Diff t(1)* is also positive and statistically significant. The coefficient on the *Diff-in-Diff* is negative and statistically significant in both models with and without controls. This indicates that implementation of the national minimum wage had a negative effect on weekly hours of work. When the minimum wage increased, employers responded by reducing the number of hours of work for their employees.

Table 9. Estimates Of the Minimum Wage Effect on Hours of Work by Gender (Weighted)

VARIABLES	**Hours of work - females**		**Hours of work- males**	
Mean control t(0)	38.591	52.860	43.971	58.586
Mean treated t(0)	41.166	54.118	47.003	60.129
Diff t(0)	2.575 *** (0.020)	1.258*** (0.020)	3.032*** (0.018)	1.543*** (0.017)
Mean control t(1)	38.919	52.603	44.030	58.371
Mean treated t(1)	40.948	53.681	47.090	60.462
Diff t(1)	2.029 *** (0.019)	1.078 *** (0.019)	3.061*** (0.018)	2.091 *** (0.017)
Diff-in-Diff	-0.546*** (0.028)	-0.180 *** (0.025)	0.029 (0.025)	0.548*** (0.022)
Covariates	N	Y	N	Y
Observations: before : after	3745 3591		3621 3451	
robust standard errors in parenthesis **** p<0.01, **p<0.05, *p<0.1*				

Source: Own calculations based on StatsSA(QLFS, 2018-2019)
Notes: The specification in column 3 and column 6 include demographic, and labour market controls. The full regression output is in the Appendix.

Table 9 displays results for the effect of the national minimum wage on hours of work for females and males separately. Based on these results we analyse whether there are gender differences in the effect of the minimum wage on hours of work. For females, the coefficient on the *Diff-in-Diff* variable is negative and statistically significant indicating that in the post-treatment period, employers responded by decreasing number of working hours for females.

Before controlling for other covariates hours of work for women decreased by 54.5% on average which reduced to a 14.2% decline after controlling for covariates. For males, the coefficient on the *Diff-in-Diff* variable is positive and statistically significant in the model which controls for covariates. This suggests that employers responded by increasing the number of hours of work in the post-treatment period, by 54.8%.

5.3. EFFECT ON EMPLOYMENT

For the employment variable, we ran a probit regression so the coefficients on employment represent the probability of staying employed in the post-treatment period conditional on being employed in 2018Q4. As indicated, our sample for employment includes individuals who were employed as paid workers in 2018Q4 and were present in the 2019Q1 dataset i.e. after the national minimum wage came into effect. For this variable, the coefficient of interest is the treatment dummy variable which tells us whether there were statistically significant differences in the probability of being employed for the treatment group and the control group. Hence for the employment variable, we exclude the time dummy variable and the interaction term as in Bhorat et al., 2021).

Table 10. Estimates Of the Minimum Wage Effect on Employment for the Pooled model (Weighted)

Variable	Coefficient	Coefficient
Treat	-0.015* (0.007)	-0.012* (0.007)
_constant	1.816*** (0.085)	1.820*** (0.422)
Controls	N	Y
Observations Wald Chi2(1) Wald Chi2(22) Prob > chi2 Pseudo R2	4682 3.29 0.0000 0.00680	4682 112.02 0.0000 0.0680
robust standard errors in parenthesis **** p<0.01, **p<0.05, *p<0.1*		

Source: Own calculations based on StatsSA(QLFS, 2018-2019)
Notes: the coefficient for the employment probit model are marginal effects therefore are interpreted as changes.

Wald test to test whether the parameters of interest are simultaneously equal to zero is rejected (p-value = 0.000), showing that our estimate of the model is statistically significant with a chi-square of 112.02 and 22 degrees of freedom. The pseudo-R-squared shows that variables in the

model explain 6.8% of the probability of being employed. This may be because there are other factors that affect the probabilities of being employed that are not included in our model.

The coefficient treat is statistically significant at 10% showing that there are differences in the probability of staying employed for the treatment and control group after the minimum wage hike. The coefficient is negative suggesting that covered workers are less likely to stay employed after the minimum wage hike. This is supported by the descriptive statistics for minimum wage workers which showed that the number of workers earning below the minimum wage decreased after the policy came into effect. The likelihood of staying employed in the post-minimum wage period decreases by 1.2% - 1.5%.

Lastly in Table 11, we present results for the employment probabilities by gender to investigate whether after the implementation of the national minimum wage there are differences in employment probabilities of males and females.

Table 11. Estimates Of the Minimum Wage Effect on Employment by Gender (Weighted)

	Females		Males	
Variable	Coefficient	coefficient	Coefficient	Coefficient
Treat	-0.029 *** (0.076)	-0.024 * (0.004)	-0.006 (0.011)	-0.004 (0.010)
_constant	2.172*** (0.153)	3.334 *** (0.385)	1.655*** (0.102)	2.758*** (0.433)
Controls	N	Y		
Observations Wald Chi2(1) Wald Chi2(22) Prob > chi2 Pseudo R2	2385 8.15 0.0043 0.0109	2363 58.87 0.000 0.0667	2297 0.26 0.0000 0.0003	2297 91.06 0.0000 0.0984
robust standard errors in parenthesis **** p<0.01, **p<0.05, *p<0.1*				

Source: Own calculations based on StatsSA(QLFS, 2018-2019)

Notes: the coefficient for the employment probit model are marginal effects therefore are interpreted as changes

As we mentioned when discussing results for the overall employment model, for the employment regression the variable of interest is treatment as the estimation model excludes *Time* and the *Diff-in-Diff* variables. For females, the coefficient on the *treat* dummy variable is negative and statistically significant. This suggests that the implementation of the national minimum wage reduced women's probability of staying employed in the post-treatment period. Females who are covered by the national minimum wage are 2.4% less likely to stay employed

after the minimum wage hike. The coefficient on the *treat* dummy variable is statistically insignificant for males, telling us that the national minimum wage hike had no significant impact on men's probability of staying employed. These results suggest that the national minimum wage could have worsened women's labour market opportunities relative to men. This could be partly driven sectoral effects as there are female-dominated industries such as the wholesale and retail trade, community, social and personal services, and the private households.

5.4. PLACEBO REGRESSIONS

In Table 12 we display results for placebo regressions. These are estimates of our model based on individuals who were earning above the national minimum wage in 2018Q4, to observe whether any change occurred in their wages and hours of work in 2019Q1 where there was a change in the national minimum wage. If we were to observe effects similar to the ones found in Table 7 and Table 9 for these individuals who were earning above the national minimum wage in 2018Q4 it would call into question any causal interpretations of the results found in Table 7 and Table 9. As seen in the Table 12, no significant changes were observed for the coefficients that indicate treatment effects for both males and females. Therefore, the results from the placebo regressions support the view that the NMW influenced the wages and hours of work of minimum wage earners in a causal way.

Table 12. Placebo Tests for Log of hourly wages and hours of work- by Gender

VARIABLES	**LOGWAGES**		**HOURS OF WORK**	
	Females	Males	Females	Males
Mean control t(0)	4.309	4.604	50.366	58.632
Mean treated t(0)	2.756	3.045	50.789	69.784
Diff t(0)	-1.552 *** (0.022)	-1.560*** (0.020)	0.422 (0.418)	1.152*** (0.402)
Mean control t(1)	4.266	4.603	50.109	58.763
Mean treated t(1)	2.726	3.038	50.402	59.607
Diff t(1)	-1.540*** (0.022)	-1.566*** (0.021)	0.293 (0.425))	0.844 ** (0.400)
Diff-in-Diff	0.013 (0.639)	-0.006 (0.027))	-0.129 (0.430)	-0.308 (0.438)
Covariates	Y	Y	Y	Y
Observations: before : after R-squared	5467 5200 0.64	5753 5567 0.63	5467 5297 0.15	5753 5538 0.17
robust standard errors in parenthesis **** p<0.01, **p<0.05, *p<0.1*				

Notes: The full regression output is in the Appendix

SECTION 6. CONCLUSION OF STUDY

The objective of the current study is to evaluate whether the impact of the national minimum wage on labour market outcomes differs for males and females in South Africa. Descriptive statistics were used to observe patterns and to gain insights into the distribution of our labour market outcomes. The Difference-in-Differences estimator was employed to investigate whether the effects of the national minimum wage on wages, hours of work, and employment differs for males and females in South Africa using panel data constructed from StatsSA's Quarterly Labour Force Surveys from 2018Q2 to 2019Q3.

For the two groups, male workers and female workers, there were statistically significant differences in wages over time, although the differences were marginal for both groups. However, the results do show that on average, the national minimum wage had a positive effect on wages for females and males, but the effect was greater for males compared to females. This suggests that the national minimum wage effects on wages differs for males and females. These results are similar to those of previous studies Bhorat et al. (2013) and Hertz (2005) who study the effect of the minimum wage in the domestic work sector. The effects for the current study are lower compared to other studies, rationale for the small effects may be the short period under analysis which reduces the treatment effects. The adjustment of production processes by employers in response to the national minimum wage are likely to take a longer period than that the current study considers. According to Bhorat et al. (2021), another reason may be that since the national minimum wage was announced two years before January 2019 when the law came into effect, employers may have begun modifying wages after the first announcement was made. Besides the effects of the NMW may be lower because the QLFS data does not distinguish between South African workers that are covered and workers from other countries whose wages fall below the national minimum wage but are generally not covered. Therefore, after the implementation of the national minimum wage, they remain uncovered.

For hours of work variable, our results provide proof that the effect of the national minimum wage on hours of work differs for males and females. The estimates show that the national minimum wage has a negative effect on hours of work for females, while for males the law has a positive effect. There was an increase in working hours for males and a fall in working hours for females, however, similar to the wage estimates the effects were low on the margins.

Results for the pooled model of employment for males and females show that the introduction of a national minimum wage led to a fall in employment, this was also evident in the descriptive statistics. These results are consistent with Bhorat et al. (2014), Piek & Von Vintel (2018:2020) who found that in the agriculture industry, the implementation of the sectoral minimum wage resulted in a fall in employment. Although the overall model gives compelling evidence that the implementation of the national minimum wage law had disemployment effects, when running the model separately for males and females we found that the effect is only visible for female workers. For female workers, the implementation of the law led to a fall in the chances of staying employed while for male workers, the introduction of the national minimum wage did not affect the probability of staying employed.

Our results suggest that although the national minimum wage law is in place to reduce labour market inequalities and improve the incomes of poor workers, it tends to increase gender inequalities in the labour market. While there is a marginal increase in wages for both genders, women endure a reduction in hours of work and chances of maintaining their jobs post imposition of national minimum wage, whereas men do not. This suggests a need for gender sensitive policies which complement the minimum wage law. These should be geared to protect women's employment and cushion them from reduction in hours of work. For example, the government can give tax breaks to employers who satisfy these conditions for workers who are covered by the minimum wage. Job creation polices targeted at skills possessed by women who are covered by the minimum wage are also necessary so that they can have chances of moonlighting in response to a reduction in hours of work by one employer.

We conclude that further research is required to understand whether the national minimum wage affect males and females differently. The current data is limited in that once an individual is part of the QLFS they can be followed only up to 4 consecutive quarters. There is a need to investigate long term effects of the national minimum wage. It is notable that we cannot detect the effect of minimum wage non-compliance on our study which might have been a factor in the low margins in our estimates, especially in a developing country. Further our results can only be considered as suggestive of the effect of the minimum wage effect on labour market outcomes as the propensity score matching component of our DID estimation had a few variables that did not comply with the covariate balancing property.

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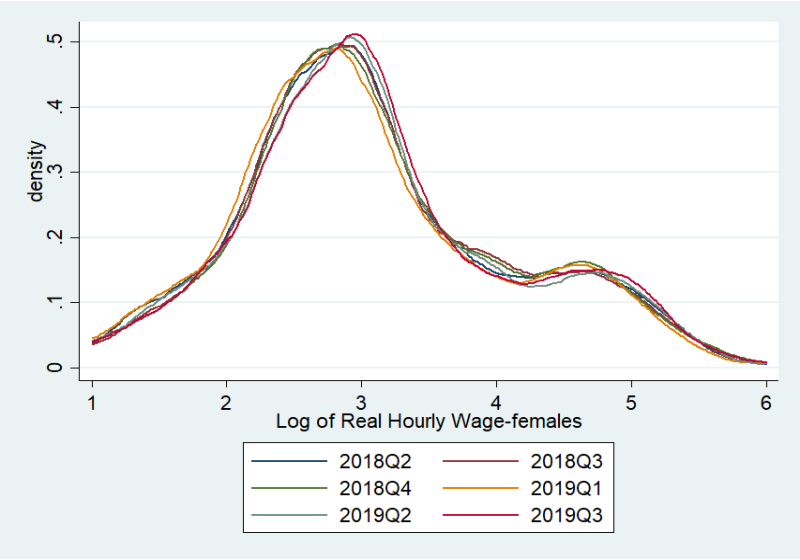
APPENDICES

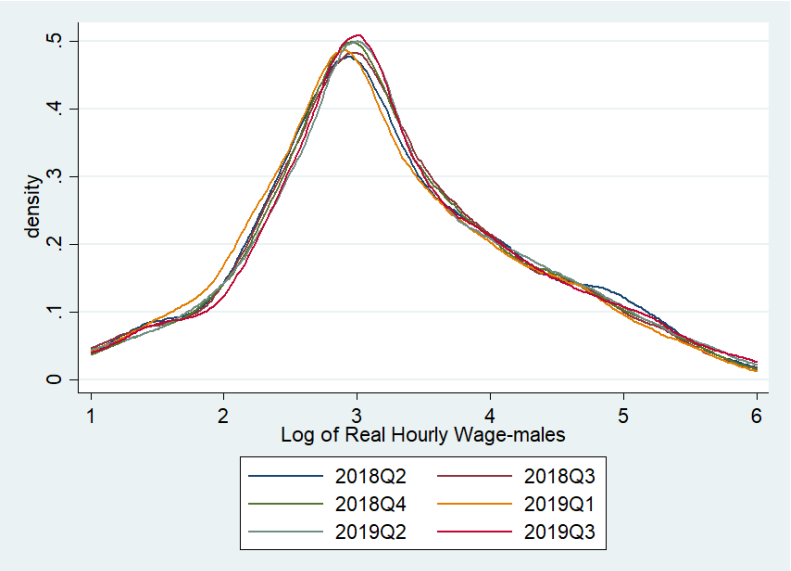
APPENDIX 1. KERNEL DENSITY FUCNTIONS BY GENDER

Kernel Density For Log Real Hourly Wage, 2018q2-2019q3-Females



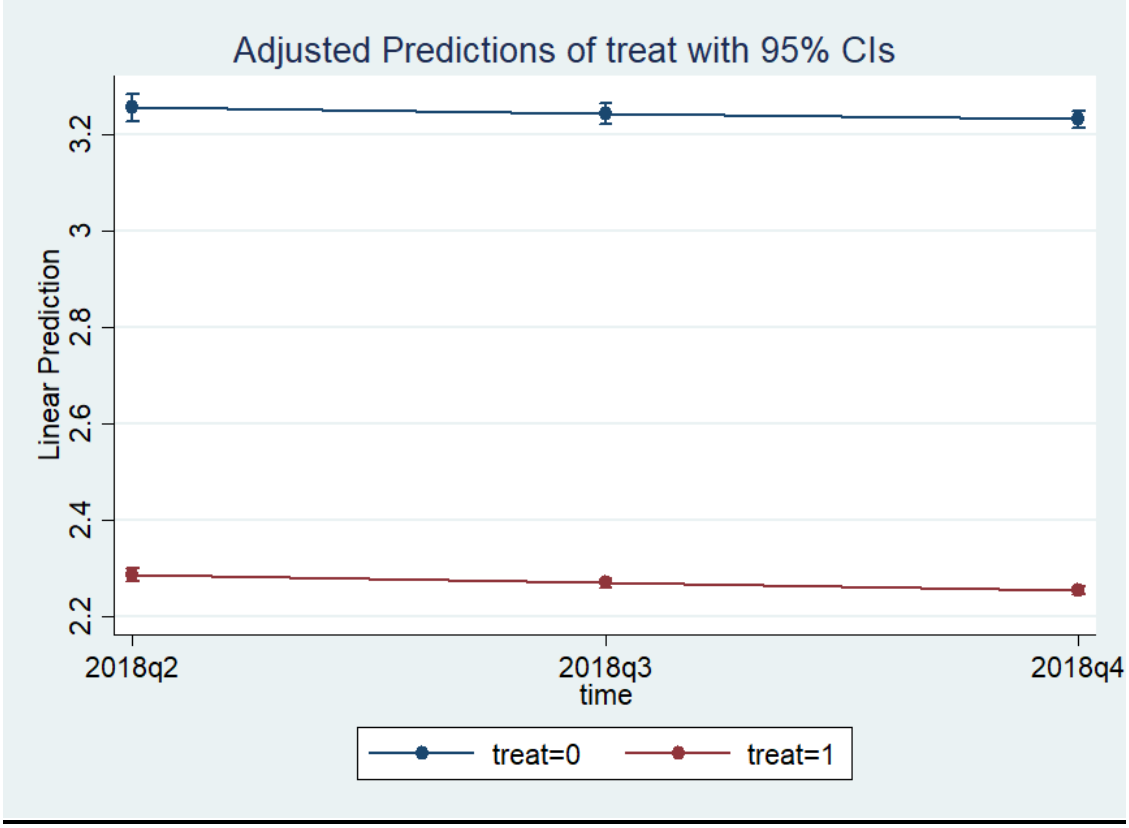
Source: Own calculations based on StatsSA (QLFS, 2018Q2-2019Q3), real values reflected in 2019Q1 constant prices, estimates are weighted.

Kernel Density for Log Real Hourly Wage, 2018q2-2019q3-Males



Source: Own calculations based on StatsSA (QLFS, 2018Q2-2019Q3)

APPENDIX 2: TEST FOR THE PARALLEL TREND ASSUMPTION



Source: Own calculations based on StatsSA(QLFS, 2018-2019)

APPENDIX 3. ESTIMATES OF THE MINIMUM WAGE ON LOG OF REAL HOURLY WAGES AND HOURS OF WORK

Variables	Log(Wages)-Pooled model	Log(Wages)-females	Log(Wages)-males	Hours of work-Pooled model	Hours of work-females	Hours of Work-Males
Mean control t(0)	3.399	3.337	3.422	59.847	52.860	58.586
Mean treated t(0)	2.529	2.482	2.546	60.675	54.118	60.129
Diff t(0)	-0.870*** (0.012)	-0.855*** (0.001)	-0.876*** (0.001)	0.827 *** (0.013)	1.258 *** (0.020)	1.543*** (0.017)
Mean control t(1)	3.369	3.307	3.393	59.695	52.603	58.371
Mean treated t(1)	2.519	2.463	2.544	60.381	53.681	60.462
Diff t(1)	-0.849*** (0.014)	-0.844*** (0.001)	-0.849*** (0.001)	0.685 *** (0.013)	1.078 *** (0.019)	2.091 *** (0.017)
Diff-in-Diff	0.020*** (0.017)	0.010*** (0.001)	0.027*** (0.001)	-0.142 *** (0.017)	-0.180 *** (0.001)	0.548*** (0.022)
Hours of Work	-0.006	-0.007	-0.005			

	(0.000)	(0.000)	(0.000)			
Age categories						
20-24	0.142 (0.075)	0.292 (0.003)	0.049 (-0.003)	-1.816*** (0.035)	0.605*** (0.062)	-0.061 (0.047)
30-39	0.143 (0.075)	0.285 (0.003)	0.058 (0.003)	-2.261*** (0.035)	0.705*** (0.061)	-0.818*** (0.047)
40-49	0.121 (0.076)	0.264 (0.003)	0.039 (0.003)	-2.382*** (0.036)	0.260*** (0.062)	-0.800*** (0.048)
50-59	0.107 (0.077)	0.273 (0.003)	0.000 (0.003)	-3.198*** (0.036)	-0.261*** (0.063)	-2.457*** (0.049)
Educational Attainment						
Primary	0.080 (0.046)	0.058 (0.002)	0.102 (0.002)	2.614*** (0.025)	2.275*** (0.033)	0.601 (0.036)
Inc. Secondary	0.112*** (0.030)	0.102** (0.001)	0.123*** (0.001)	3.475*** (0.015)	4.841*** (0.021)	0.623** (0.020)
Matric	0.074*** (0.026)	0.099*** (0.001)	0.063*** (0.001)	3.647*** (0.012)	6.530*** (0.017)	0.204** (0.017)
Tertiary	0.012** (0.027)	0.023** (0.001)	0.019* (0.001)	4.538*** (0.012)	7.940*** (0.017)	0.047 (0.017)
Marital Status						
Married/Living together	-0.006* (0.029)	-0.017** (0.001)	0.006 (0.001)	0.124*** (0.016)	0.916*** (0.019)	-0.912*** (0.010)
Separated/Divorced	0.049 (0.029)	-0.056 (0.001)	-0.044 (0.002)	-0.860*** (0.016)	-0.727** (0.019)	-1.117*** (0.08)
Race						
Black	-0.032 (0.022)	-0.027 (0.001)	-0.039** (0.001)	1.394*** (0.010)	1.300*** (0.015)	1.595*** (0.013)
Residence						
Urban	0.063*** (0.015)	0.089*** (0.001)	0.030 (0.001)	-0.466*** (0.008)	0.213 (0.011)	-1.886*** (0.011)
Industry						
Mining	-0.204 (0.071)	-0.315*** (0.004)	-0.148*** (0.002)	0.227*** (0.028)	-2.800*** (0.070)	9.724*** (0.031)
Manufacturing	-0.203 (0.040)	-0.164** (0.002)	-0.212** (0.001)	-1.613*** (0.018)	-0.347** (0.041)	-0.874*** (0.021)
Utilities	-0.260* (0.150)	-0.509 (0.005)	-0.130 (0.004)	-3.951*** (0.049)	-5.247*** (0.091)	-1.636*** (0.031)
Construction	-0.123** (0.039)	-0.228*** (0.003)	-0.073** (0.001)	-4.791*** (0.019)	-16.231*** (0.047)	-2.210*** (0.020)
Wholesale and Retail	-0.109*** (0.039)	-0.166*** (0.002)	-0.064*** (0.001)	1.887*** (0.016)	1.796*** (0.040)	3.324*** (0.019)
Transport	-0.199*** (0.035)	-0.325*** (0.002)	-0.151** (0.001	8.017*** (0.019)	0.724 (0.042)	10.670*** (0.020)
Financial Services	-0.070*** (0.130)	-0.177*** (0.002)	0.007*** (0.001)	3.118*** (0.017)	0.425 (0.040)	6.149*** (0.019)
Community, Social and Personal Services	-0.243 (0.036)	-0.296*** (0.002)	-0.214** (0.001)	-7.990*** (0.016)	-7.974*** (0.038)	-5.193*** (0.020)
Private households	-0.0167*** (0.036)	-0.232*** (0.002)	-0.084*** (0.002)	-9.788*** (0.017)	-7.025*** (0.039)	-12.788*** (0.024)

Observations:before : after R-squared	7186 6780 0.32	3745 3519 0.26	3621 3451 0.23	7366 6993 0.19	3745 3519 0.18)	3745 3
Robust standard errors in parenthesis **** p<0.01;** p<0.05; p<0.1*						

Source: Own calculations based on StatsSA(QLFS, 2018-2019)

APPENDIX 4. ESTIMATES OF THE MINIMUM WAGE ON EMPLOYMENT

	Pooled Model	Females	Males
Treat	-0.012** (0.007)	-0.024*** (0.006)	-0.004 (0.010)
Age categories			
20-29	-0.035 (0.393)	-0.070*** (0.027)	-0.024 (0.020)
30-39	-0.014 (0.308)	-0.036* (0.018)	-0.008 (0.015)
40-49	0.0139 (0.245)	-0.003 (0.014)	0.012 (0.014)
50-59	0.008 (0.049)	(.)	(.)
Educational attainment			
primary	0.011 (0.016)	-0.145* (0.085)	-0.027 (0.067)
Inc. secondary	0.211 (0.018)	-0.025 (0.028)	-0.120** (0.055)
Matric	0.031** (0.015)	-0.018 (0.016)	-0.068*** (0.026)
Tertiary	0.037*** (0.007)	-0.017 (0.018)	-0.047 (0.030)
Marital status			
married/living together	0.011* (0.006)	-0.032** (0.016)	-0.019 (0.026)
divorced/separated/ widowed	0.251*** (0.007)	-0.034* (0.020)	0.001 (0.026)
race			
Black	-0.009 (0.008)	-0.006* (0.011)	-0.101 (0.117)
residence			
urban areas	-0.008 (0.006)	-0.004 (0.008)	-0.009 (0.009)
Industry			
Mining	-0.000 (0.013	(.)	(.)
Manufacturing	-0.064** (0.026)	0.006 (0.010)	0.008 (0.014)

Utilities	-0.058 (0.364)	0.012 (0.016)	-0.059 (0.023)
Construction	0.001 (0.013)	-0.046 (0.078)	-0.038 (0.068)
Wholesale and retail trade	-0.000 (0.014)	-0.001 (0.120)	0.014 (0.117)
Transport	0.022 (0.016)	-0.007 (0.014	0.006 (0.013)
Financial Services	-0.019 (0.0160)		0.0244 (0.016)
Community; social and personal services	0.004 (0.015)	-0.002 (0.011)	-0.061 (0.310)
Private households	-0.008 (0.014)	0.018 (0.128)	0.009 (0.015)
Observations F(22, 14092) Prob > F R-squared	4682 112.02 0.0000 0.0680	2363 58.874 0.0000 0.0667	2297 91.06 0.0000 0.0984
Robust standard errors in parenthesis **** p<0.01;** p<0.05; p<0.1*			

Source: Own calculations based on StatsSA (QLFS, 2018-2019)

APPENDIX 5: PLACEBO REGRESSIONS

Variables	Log(Wages)-females	Log(Wages)-males	Hours of work-females	Hours of Work-Males
Mean control t(0)	4.309	4.604	50.366	58.632
Mean treated t(0)	2.756	3.045	50.789	59.784
Diff t(0)	-1.552*** (0.022)	-1.560*** (0.020)	0.422 (0.418)	1.552*** (0.402)
Mean control t(1)	4.266	4.603	50.109	58.763
Mean treated t(1)	2.726	3.038	50.402	59.607
Diff t(1)	-1.540*** (0.022)	-1.566*** (0.021)	0.293 (0.425)	0.844 ** (0.400)
Diff-in-Diff	0.013 (0.027)	-0.006*** (0.027)	-0.129 (0.430)	-0.308 (0.438)
Hours of Work	-0.006 (0.001)	-0.005*** (0.001)		
Age categories				
20-24	0.230** (0.110)	0.022 (0.076)	0.400 (1.587)	-2.336* (1.347)
30-39	0.262** (0.110)	0.052 (0.076)	0.887 (1.583)	-2.423* (1.346)
40-49	0.252** (0.110)	0.031 (0.077)	0.372 (1.589)	-2.805** (1.363)
50-59	0.292***	0.091	0.367	-3.556***

	(0.111)	(0.079)	(1.602)	(1.374)
Educational Attainment				
Primary	-0.538*** (0.045)	-0.475*** (0.030)	-8.765*** (0.998)	-0.424 (1.233)
Inc. Secondary	-0.468*** (0.030)	-0.450*** (0.024)	-6.241*** (0.569)	-0.080 (0.472)
Matric	-0.420*** (0.023)	-0.388*** (0.024)	-3.694*** (0.359)	0.010 (0.338)
Tertiary	-0.355*** (0.022)	-0.549*** (0.054)	-1.769*** (0.285)	-0.205 (0.301)
Marital status				
Married/Living together	0.000 (0.000)	0.048*** (0.015)	0.000 (0.000)	1.214 (0.530)
Separated/Divorced	-0.053** (0.027)	0.059 (0.043)	0.901** (0.443)	0.000 (0.000)
Race				
Black	-0.117*** (0.021)	-0.163*** (0.020)	0.495* (0.268)	1.000*** (0.244)
Residence				
Urban	0.089*** (0.001)	0.001 (0.016)	0.440 (0.303)	-1.567*** (0.321)
Industry				
Mining	0.055 (0.092)	0.138*** (0.034)	0.173 (0.768)	-7.105*** (0.702)
Manufacturing	0.036 (0.060)	-0.052 (0.032)	0.013 (0.835)	-5.295*** (0.612)
Utilities	0.186 (0.122)	0.112* (0.068)	-0.401 (0.605)	-7.527*** (0.573)
Construction	0.076 (0.066)	-0.005 (0.031)	-2.291*** (0.737)	-7.840*** (0.705)
Wholesale and Retail	0.018 (00.057)	0.002 (0.029)	-12.912*** (1.037)	-8.875*** (0.618)
Transport	0.061 (0.060)	0.070 (0.033	1.514** (0.608)	-4.596*** (0.601)
Financial Services	0.098* (0.058)	0.088*** (0.029)	-0.534 (0.611)	-3.207*** (0.602)
Community, Social and Personal Services	0.073 (0.057)	0.035** (0.031)	-5.543*** (0.589)	-10.259*** (0.617)
Private households	-0.013 (0.057)	-0.019*** (0.038)	-7.681*** (0.039)	-21.315*** (0.827)
Observations:before : after R-squared	5467 5200 0.67	5753 5567 0.63	5467 5297 0.15	5753 5538 0.17
Robust standard errors in parenthesis **** p<0.01;** p<0.05; p<0.1*				

Source: Own calculations based on StatsSA (QLFS, 2018-2019)