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THE DETERMINANTS OF MINIMUM WAGE VIOLATION IN SOUTH AFRICA

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Abstract

This paper investigates the determinants of non-compliance or violation of minimum wage legislation in South Africa, a country where violation is high, at just under 50 percent. The number of labour inspectors per capita is used as a proxy for enforcement, whilst non-compliance is measured using an index of violation that measures both the proportion of individuals violated, as well as the depth of violation of an individual. Due to the potential simultaneity between enforcement and compliance, the number of labour inspectors is instrumented by the number of non-inspectors. The results suggest that there are a variety of factors impacting on violation, including firm-level, sectoral and spatial characteristics. One of the key determinants of violation is found to be the local unemployment rate.

Key Words: Minimum Wage, Depth of Violation, South Africa

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I. Introduction

A key problem affecting wage earners in developing countries is the issue of law enforcement, particularly the enforcement of legislation pertaining to minimum wages. There is a burgeoning literature on the problem of non-compliance amongst employers with minimum wage laws in developing countries (Basu, Chau and Kanbur, 2007; Andalón and Pagés, 2008). However, there is little empirical research on the determinants of non-compliance, particularly on the effects of enforcement on compliance with minimum wage laws. This paper attempts to investigate the determinants of non-compliance with minimum wage laws in South Africa, a country where 45 percent of employers fail to comply with minimum wage legislation.

As Ronconi (2010) notes, there are two key challenges in estimating the effect of enforcement on compliance. Firstly, finding appropriate measures for both enforcement and compliance is problematic. In this paper, we measure violation or non-compliance of minimum wages using a family of indices of violation introduced in Bhorat, Kanbur and Mayet (2010a), which capture both the incidence and the depth of violation[1]. Enforcement is measured using the number of labour inspectors per capita as a proxy for enforcement.

Secondly, there is a problem of endogeneity due to the potential simultaneous relationship between enforcement and compliance. On the one hand, enforcement is likely to increase compliance due to firms being more likely to comply if their probability of being caught is higher. On the other hand, a government agency is likely to increase the number of inspectors or enforcement resources in response to low compliance levels. This paper attempts to deal with this endogeneity using the number of non-inspectors per capita as an instrument for the number of labour inspectors.

The rest of the paper is structured as follows. Section II below attempts to provide a brief summary of the issue of minimum wage violation in South Africa. Section III reviews the international literature and theory surrounding the determinants of non-

[1] This family is analogous to the family of poverty indices introduced by Foster, Greer and Thorbecke (1984).

compliance with minimum wages. Section IV empirically investigates the determinants of violation using an instrumental variable approach. The final section, Section V, concludes.

II. Minimum Wage Violation in South Africa

In South Africa, minimum wages, known as sectoral determinations, are set by the Employment Conditions Commission[2], which is a representative body within the Department of Labour (DoL) of South Africa. The minimum wages set are sector-occupation-location specific and are shown in Table 1 (see Bhorat, Kanbur, and Mayet (2010b) for a detailed discussion of the various sectoral minima). However, levels of violation of minimum wage legislation in South Africa are disturbingly high, with the overall level of violation reaching nearly 50 percent in 2007 (Bhorat, Kanbur and Mayet, 2010b). This measure seems high compared with other countries: For instance in Argentina compliance with the minimum wage is 95% (Ronconi, 2008), whilst in Kenya non-compliance is estimated at around 17% for salaried non-agricultural workers (Andalon and Pagés, 2008).

In this paper, we use an index of violation introduced in Bhorat, Kanbur, and Mayet (2010a) to measure violation. Derived from the Foster-Greer-Thorbecke (1984) poverty measures, this index is used to measure the share of violated workers receiving sub-minimum wages, as well as the depth of violation, namely, the average gap between the stipulated minima and the actual wage paid. The index of violation has the following form:

$$V = E\left\{\left[\frac{\left(w^m - w\right)}{w^m}\right]^{\alpha}\right\} \qquad (1)$$

where w denotes wage, w^m denotes the relevant minimum wage, α is an index that emphasizes concern on the depth of violation, and E is the expectation operator with respect to the wage distribution in the sector to which w^m applies. This family is analogous to the family of poverty indices introduced by Foster, Greer and Thorbecke (1984). When α

[2] The ECC was established in 1999 when it replaced the Wage Board, in accordance with the Basic Conditions of Employment Act (BCEA), No 75 of 1997.

= 0, the index collapses to the standard measure of violation—the percentage of covered workers earning sub-minimum wages. When $\alpha = 1$, the index captures the average depth of violation. Increasing the value of the parameter α places higher emphasis on larger violations. Whilst V_0 measures the percentage of workers violated, that is, earning below the minimum, the ratio (V_1/V_0) facilitates the interpretation of V_1, since it denotes the percentage shortfall of the average wage of violated workers from the minimum wage. Put differently, violated workers in this sample are earning on average (V_1/V_0) below the relevant minima.

In Bhorat, Kanbur, and Mayet (2010b), the authors attempt to estimate violation of minimum wages for the first time in South Africa using detailed matching of occupational, sectoral and locational codes in the 2007 Labour Force Survey (Statistics South Africa) to the gazetted minimum wages[3]. The results from this paper are reproduced in Table 2. Non-compliance is highest within the Security sector, with worryingly high estimates of nearly 70% in some areas in 2007, followed by the Farm and Forestry sectors (55% and 53% respectively). Furthermore, occupation as well as the location of employment matters in the level and depth of violation observed. For example, in A type areas, whilst 16% of managers within the Retail sector earn below the minimum, the estimate for clerks in the Retail sector lies at 45%. However, if areas designated by the DoL as type C are instead considered, the proportion of Managers and Clerks violated increases to 36% and 56% respectively. Since the pattern of violation is not uniform across various sectors, occupations, and locations, it is important to understand the determinations of violation in order to attempt to explain the variation in non-compliance within the country.

Another interesting result observed in the violation estimates for South Africa is that the pattern of violation changes depending on whether we measure violation as the proportion of individuals earning below the minimum or as the shortfall of the wages of an

[3] The sectoral minima issued by the DoL are specific to the location of the workers. Areas are designated as types A, B, C, etc. This demarcation was conducted on the basis of the average household income recorded for the municipal area concerned in the 1996 census:
A – Average income greater than R24, 000 per annum
B – Average income between R12, 000 and R24, 000 per annum
C – Average income less than R12, 000 per annum

individual from the minimum. For instance, whilst the proportion of Domestic workers violated (40%) is lower than that of Farm workers (55%), the depth of violation for these two cohorts is similar (31% and 33% below the minima respectively). Another example is the Civil Engineering sector, which yields the lowest estimate for workers earning below the sector minimum, but the highest depth of violation within the sample. This result suggests both the share of workers below the minima and the distance of these workers below the minima matter for policy makers, as does understanding the factors contributing to both the incidence and the depth of violation. Therefore, in our analysis that follows, the determinants of both the probability of an individual being violated, as well as of the depth of violation, will be investigated.

III. What Determines Minimum Wage Violation?

Whilst the literature suggests that enforcement increases compliance, there is little empirical research measuring the effects of enforcement on compliance. Ronconi's (2010) study on Argentina constitutes one of the first attempts to empirically estimate the effect of government enforcement on compliance with labour regulations in a developing country. Using data from 1995 to 2002, he attempts to analyse the effect of enforcement on compliance using a two stage least squares estimation procedure. Ronconi uses the number of labour inspectors per capita working in provincial public enforcement agencies as a proxy for enforcement activity. He measures the extent of compliance by the percentage of private sector employees receiving legally mandated benefits, such as wages at the statutory minimum. Enforcement, as measured by the number of labour inspectors, was found to be positively associated with the extent of compliance.

In South Africa, the DoL uses a team of labour inspectors whose job is to enforce compliance with these sectoral determinations. Inspections in most cases are triggered by complaints by clients, whilst high risk sectors are identified and targeted through focused blitz inspections. There has been some discussion attributing regional variation in the degree of violation of minimum wage laws, to differences in the numbers and distribution of inspectors within areas, as well as the possibility of the corruption of the inspectorate deployed. Labour inspectors are allocated at the provincial level in South Africa, and these

numbers were obtained from the DoL for 2007. In 2007, there were in total 782 labour inspectors employed in the country, or in other words, 59 inspectors per million workers[4].

Another measure of relevance in the compliance literature is the Kaitz index, which provides a measure of the rigidity or 'toughness' of the minimum wage set (Andalón and Pagés, 2008). A notable result from this study is that although minimum wages in Kenya are set high relative to the median wage, non-compliance levels in the country are also high. Interestingly enough, sectors and occupations with a high Kaitz index are also found to have a higher percentage of non-compliance and vice versa (Andalón and Pagés, 2008). Certainly then, the ratio of the minimum wage to the median is an interesting measure to consider when investigating the possible determinants of non-compliance or violation.

Two types of measures of the Kaitz index are included in the analysis below[5]. The first (K_1) is the ratio of the mean adjusted minimum wage (in the respective sector-occupation-location group) to the median wage in overall salaried employment, whilst the second measure (K_2) is the ratio of the mean minimum wage in that category relative to the median wage in each sector-occupation-location group. A study by Levin-Waldman (1997) suggests that the minimum wage be set at the level of the median wage for the unskilled. Therefore, a third measure has been included, which provides the ratio of the minimum wage within each group to the median wage for unskilled workers (that is, Domestic workers and workers engaged in Elementary occupations).

Table 3 presents estimates of the Kaitz ratio for South Africa for 2007 by sector. The two specifications of the Kaitz index, K_1 and K_2, were approximated for each of the sectoral determinations by their respective sector-occupation-location categories. The indices have been ranked, starting from the highest value to the lowest. The ranks of the

[4] This seems low compared to countries such as Uruguay (67) and Panama (69), but is larger than the size of the inspectorate per million workers in Argentina (22), Mexico (6), Columbia (15), and Brazil (34) (Ronconi, 2010).

[5] The Kaitz ratio is usually estimated as the ratio of the minimum wage, , to the mean wage, . However, according to the literature (Andalón and Pagés, 2008) in countries with substantial levels of wage inequality, or if the minimum wage is suspected to influence the mean wage, it is preferable to use the median wage to estimate the Kaitz ratio instead of the mean. Following the literature then, the median wage was used as the denominator when estimating the Kaitz index for South Africa.

indices have been shown in parentheses in the table. For instance, the rank of the K_1 Kaitz index for the Security sector was 1 in 2007, suggesting that the Kaitz index for Security workers was the highest among all other sectors in that year. This is an interesting result, given that Security workers were also the most violated cohort in 2007, in terms of the proportion of individuals violated (67%).

The median wage for overall salaried employment was R 2,500 in 2007. In 2007, the K_1 Kaitz ratio for South Africa, estimated as the ratio of the mean minimum wage to the overall median wage, was 0.61. In 2007, the mean adjusted minimum wage for Retail sector works was R 2,304, while the median wage of covered workers in that sector was 2,500, yielding a Kaitz ratio of 0.92. Several sectors record a K_2 ratio of above 1 in both years, namely Farming, Forestry and Security. What is clear from the estimates below is that the ratio of the minimum wage to the median is quite high in South Africa in several sectors, irrespective of whether the K_1 or the K_2 measure is used. Comparing the Kaitz estimates for South Africa with other developing countries indicates that these countries also yield high measures of the ratio of the minimum to the median wage. For example, the Kaitz index for Kenya stood at 0.76 for general workers during 1998 to 1999 (Andalón and Pagés, 2008), while the Kaitz index in Columbia also found to be high at 0.68, with a number of minimum wages in the more skilled occupations set at above two-thirds of the median (Maloney and Nuñez, 2003). The results from the third measure included in the table, that is, the ratio of the minimum wage to the median wage for the unskilled, are also interesting. This ratio is generally above 1 in both years, signifying that the minimum wage in South Africa is set very high relative to the median wage for unskilled employment. For instance, in 2007, the minimum wage within the Retail sector stood at more than double the median for the unskilled. Compared with the Kaitz measures, K_1 and K_2, the ratio of the minimum to the median of the unskilled is generally higher.

The rank correlation coefficients between the K_2 index and the violation indices are very high (Table 4). For instance, the 2007 estimate of the rank correlation between V_0 and K_2 is 89%, suggesting that the sectoral rankings according to the K_2 index are very similar to the rankings according to the violation index V_0.

In summary, the rank correlation coefficients above suggest a significant correlation between the level, depth, and severity of non-compliance (as measured by V_0, V_1, and V_2 respectively) and the level of the minimum wage relative to the median wage within the sector-occupation-location categories. The sign of the coefficients reflect a positive relationship between ranks of the level of the sectoral determination (that is, the minimum wage, w_m) relative to the median wage, and violation (non-compliance). We therefore think that the Kaitz index is an interesting variable to include in the multivariate analysis of the determinants of violation below.

Table 5 presents means and standard deviations for the measures of compliance, enforcement, and the other explanatory variables used in this study. A variety of explanatory variables were included in the analysis such as demographic, firm-level, contractual, and spatial/geographic characteristics. One interesting innovation in this paper is to provide a set of spatial and density variables to proxy for the probability of an employer being 'enforced' upon. The spatial variables constructed and included were broad labour force participants per square mile; inspectors per 100,000 people; the budget of the DoL labour offices by province; labour centres per square mile, and the unemployment rate in the district council.

In the following section, we proceed to an econometric investigation of the various determinants of violation in South African labour market, in an attempt to isolate their simultaneous impact on violation.

IV. The Determinants of Minimum Wage Violation in South Africa

For the analysis of the determinants of individual violation, we first use a probit model to investigate the determinants of the probability of an individual being violated, or in other words, receiving a wage below the stipulated minimum. The probit model is used to determine whether these factors do indeed change the likelihood of an individual being paid a wage below the minimum, as well as to quantify the marginal effects of the variables. Here, the dependent variable, V_0, is a categorical variable, taking on a value of 1 if the individual's wage is below their respective minimum or 0 if their wage is at or above

the minimum. The violation probit is estimated for the full sample of employed individuals (excluding the self-employed since they pay their own wages) who are covered by the DoL sectoral determinations. Next, for the reduced sample of violated individuals (V_0=1) only, the determinants of the depth of violation (as measured by V_1) are estimated by means of OLS regression. Hence V_1 was estimated for each individual and used as the dependent variable in the regression[6]. All non-categorical variables were logged.

Dealing with Endogeneity

One of the problems when attempting to investigate the effect of enforcement on compliance is the possibility of the reverse causal effect of compliance on enforcement. On the one hand, whilst we expect enforcement to increase compliance since a firm's propensity to violate may be inversely related to the probability of getting caught and/or penalized. On the other hand, low compliance may result in the DoL increasing the resources allocated to enforcement, such as the number of labour inspectors. In this case, OLS would become inconsistent.

One strategy to deal with this problem is to find an instrumental variable for the number of labour inspectors. This variable must be highly correlated with the endogenous variable, that is, the number of labour inspectors, but uncorrelated with violation. We are hence faced with the task of finding a plausible instrument for labour inspectors in South Africa.

We propose here the number of non-inspectors working in labour offices by province as an instrument for labour inspectors, since we would expect the number of non-inspectors to be a strong predictor of changes in the size of the inspectorate, but unrelated to compliance with minimum wages[7]. Given that the number of non-inspectors would not be expected to be correlated with the index of violation, we use the number of non-

[6] V_1 was measured as the individual wage gap using the following formula:
$(w^M-w_i)/w^M$ where w^M is the minimum wage for the individual and w_i is the individual's wage.
[7] The approach followed is similar to that used by Levitt (2002), who uses the number of municipal fire-fighters as an instrument for police officers in order to estimate the effects of police on crime.

inspectors per capita as an instrument variable[8]. However, it is important to account for factors that may affect the number of non-inspectors as well as violation, and for this purpose, the provincial budget of the DoL was used as a control.

Table 6 presents the results of a regression of the number of inspectors per capita on the number of non-inspectors in labour offices (the instrumental variable), and including various controls. The results across the specifications show that the instrumental variable is a very strong predictor of the number of labour inspectors. Having found an appropriate instrument, we now analyse the results from the multivariate analysis of the determinants of violation below.

Results

For the covariates which are dummy variables, the following are the referent variables:

Race: African
Age: 16-24 years
Area type A: other area type (B, C, D, or E)
Sectoral determination: Domestic workers
Union status: Non-union member
Firm size: Large firms
Contract: Non-written, non-permanent
Sector: Informal, non-public.

Table 7 presents the results from the probit on individual violation. Four specifications are included, the first being a probit, whilst specifications II to IV treat the inspectors variable as endogenous, using an instrumental variable approach. In Specification III the individual controls (race, gender, age, education, and the Kaitz index) have been excluded, whilst the fourth specification omits the spatial controls. Specification II is the preferred specification since it includes the full set of individual, sectoral, firm-

[8] The numbers of non-inspectors in labour offices by province, as well as the Department of Labour budgetary allocations per province were obtained from the Department of Labour of South Africa.

level and spatial controls, as well as controlling for the endogeneity of the inspectors variable by instrumenting using the number of non-inspectors.

A preliminary analysis of the results in Table 5 suggests that there are a wide range of variables impacting on the probability of violation, such as individual, sectoral, enterprise, contractual and spatial characteristics. Since the key variables of interest here are the enforcement and spatial variables, these are discussed first. Enforcement was measured using the number of labour inspectors per 100,000 people, whilst the spatial variables included a dummy variable capturing area type (that is, A areas compared with B, C, D, etc.), broad labour force per square mile; labour centres per square mile; unemployment rate of the district council, and the provincial budget of the DoL. The inspector variable was included in Specification I, whilst Specifications II to IV instrument the number of inspectors by the number of non-inspectors. The fourth specification yields a negative and significant result for the number of labour inspectors. Whilst this specification would seem to suggest that enforcement as measured by the number of labour inspectors (instrumented by non-inspectors) increases compliance, when the remaining spatial and enforcement controls are included in the probit (Specifications I, II, and III), the inspectors variable is not found to be significant. Therefore we conclude that when controlling for other spatial or enforcement characteristics, namely budgetary allocations between provinces, increasing the number of labour inspectors does not seem to exert a significant influence on compliance. The spatial/enforcement variables were included in the first three specifications. The first spatial variable was a dummy variable for workers in areas that fell under 'A' type areas. As noted earlier, these areas are generally non-rural and are specific to the various sectoral determinations. This variable was however, not found to be statistically significant in any of the specifications at the 10% level, suggesting that living in an area classified as an 'A' area as opposed to a less urban area did not significantly alter the probability of a wage earner being violated in 2007. Labour density, as captured by the log of the number of labour participants per square mile, was not a significant determinant of the probability of individual violation. However, the local unemployment rate was found to be significant in all three specifications where it was included, namely I, II, and III. The coefficient for the unemployment rate in the district council was positive and highly

significant (at the 1% level) in all the specifications where included, indicating that a higher unemployment rate in the district council results in a larger probability of violation. This finding is consistent with that of Ronconi (2010), who found unemployment to be positively correlated with noncompliance in Argentina. This result can be understood if we think of a larger number of unemployed in an area as resulting in a higher probability of workers willing to work for sub-minimum wages, and in turn a leading to a higher likelihood that employers will violate the statutory minima, knowing that surplus labour will be supplied at these sub-minimum rates. The results for the other spatial/enforcement controls however, notably the budget and the number of labour centres per square mile, were insignificant across all specifications.

The second set of key variables in this analysis was the inclusion of a number of enterprise-specific characteristics, as well as contractual characteristics capturing the nature of employment. These characteristics were included in all four specifications. In all specifications, the coefficients for small and medium-sized firms are positive and statistically significant. The results show that the size of an enterprise[9] is a key predictor of the probability of individual violation. Employees in small and medium-sized enterprises (less than 20 workers) were more likely to be violated than those in large firms with 50 employees or more. In other words, according to the results, employers in larger firms are more likely to be enforced upon. Or rather, given their visibility, employers in large enterprises are less likely to want to engage in practices which violate the minimum wage. Another possibility is that large firms are more likely to be unionized than smaller firms. A dummy variable was included equal to 1 if a worker was part of a union, and equal to 0 for non-union members. As expected, the coefficient was negative and statistically significant in all four specifications, suggesting that union workers are less likely to be violated by employers than their counterparts who are not part of a union. The key result here, however, is that large firms are less likely to violate even when controlling for worker unionization.

[9] Small firms are those with less than 9 employees, medium firms are those with less than 19 employees, medium-large firms refers to enterprises with less than 50 employees, and large firms are those with 50 employees or more. The self-employed were excluded.

Formal firms were defined as those who were registered and paid VAT, semi-formal firms were defined as those that met one of the above criteria, while informal firms were defined as those that neither reported themselves as registered nor as paying VAT. However, the formal and semi-formal coefficients were not found to be statistically significant at 10% in any of the specifications in which they were included. However, whilst the degree of formality of a firm does not seem to impact on whether or not employees are paid sub-minimum wages, whether a firm is located in the public sector or the private sector is a key determinant. Individuals employed in public sector firms or in State owned enterprises (SOEs) were significantly less likely to be violated than those employed in the non-public sector, as evidenced by the negative and significant coefficient for the public sector dummy in all four specifications (at the 1% level).

In all four specifications, the dummy variable for a written contract yields a negative and statistically significant coefficient. Employees with a written contract are less likely to be violated than those with no contract or an informal contract. The dummy variable for a permanent/fixed period contract was also negative an significant in all specifications, suggesting that individuals possessing a permanent or fixed period contract have the same likelihood of being violated as temporary, casual or seasonal workers. The duration of employment is also shown to be a significant predictor of the probability of being violated. The tenure variable was derived using information in the LFS on the year the individual started working with the current employer. The variable was estimated as the log of the number of years of employment with the present employer. This coefficient was significant and negative in all specifications, indicating that a longer tenure is associated with a significantly lower probability of being violated.

The individual characteristics included in Specifications I, II, and IV of the analysis were race, gender, age, English as the home language, and education. From the results, it is clear that both race and gender are highly significant in determining whether or not an individual is violated and is paid a wage below his/her stipulated minima. The dummy variables for Whites and Coloureds have coefficients that are significant and negative, suggesting that these population groups have a lower probability of being violated than

their African counterparts, whilst controlling for spatial, sectoral, and enterprise characteristics. The coefficient for the dummy variable for females was positive and significant, suggesting that female workers are more likely to be violated than their male counterparts.

The coefficients for the age variables are generally not statistically significant, barring the 45-54 years old age group, which has a lower probability of being violated relative to those in the 15 to 24 years or youth referent category.

An interesting result is that individuals who speak English as a home language are less likely to be paid wages that fall below the stipulated minima. The results from the educational splines suggest that better educated individuals are less likely to be violated. With the exception of the Grade 12 (Completed high school) variable, the coefficients of all splines are negative and statistically significant. The coefficient for the Diploma variable is statistically significant and negative. This suggests that possession of a Diploma as opposed to a Grade 12 education or lower reduces the likelihood of an individual being violated. The coefficient for the Degree variable is also negative and significant, implying that possession of a Degree qualification from a university, as opposed to a Diploma from a non-university higher education institution, may lead to a lower probability of violation of an employee.

Of particular interest here is the Kaitz index, which yields a positive and significant result in all four specifications. This implies that the higher the minimum wage is set relative to the median wage, the high the probability of non-compliance.

The results for the sectoral dummies are interesting. Barring the Farm, Forestry and Security sectors, all coefficients were negative and statistically significant. This suggests that workers employed in the, Retail, Taxi, Hospitality, Contract Cleaning, and Civil Engineering sectors all had a lower probability of being violated than Domestic workers. This result is as expected, give that Domestic workers are traditionally amongst the most vulnerable workers in the South African economy, along with Farm workers. The Security

sector yields a negative and significant coefficient in the third specification, but this result is not found to be robust to the remaining specifications, so we conclude the Security workers do not seem to be more at risk of being violated relative to Domestic workers.

Having investigated the determinants of the probability of individual violation, we now turn to an analysis of the factors that influence the depth of this violation, as measured by the V_1 violation index. Table 8 shows the results from the OLS and two-stage least squares instrumental variable regressions on V_1. As above, the first specification is an OLS regression including the full set of individual, firm-level, sectoral, and spatial controls. Specification II also uses the full set of variables in the first specification, instrumenting the number of labour inspectors per capita by the number of non-inspectors. Specification III and Specification IV omit the individual and spatial controls respectively. Once again, the second specification is the preferred specification, since it controls for the endogeneity of the inspector variable as well as includes the full set of relevant controls. The dependent variable, V1, was logged, as well as non-categorical right-hand side variables. The coefficients for the logged independent variables are therefore interpreted as elasticities.

From the results in Table 8, we firstly note that although demographic characteristics were important in determining the probability of violation, they do not seem to be important in predicting the size of this violation. Put differently, while race and gender play a significant role in determining whether an individual is violated or not, they are irrelevant in determining the extent of this violation, as measured by V_1. The coefficients for the race variables (barring Asians, who form less than 2 percent of the sample) and gender were statistically insignificant in all the specifications where they were included. The results suggest that the depth of violation seems to be driven more by sectoral, enterprise, contractual and spatial characteristics rather than demographic characteristics.

The key enforcement measure here, notably the number of labour inspectors per capita, yields a significant coefficient for Specification I. However, when we instrument using the number of non-inspectors per capita, this variable is no longer significant. This

result draws attention to the importance of instrumenting in the context of the endogeneity of enforcement as a determinant of compliance.

Whilst the race and gender effect observed in determining the probability of violation disappear when analysing the depth of this violation, the English as a home language variable retains its significance in all the specifications where included. The negative and significant coefficient shows that individuals who speak English as a home language whom are violated by their employers experience a depth of violation between 53 and 55% lower than non-English speakers. The results for the education splines were not statistically significant, indicating that whilst better educated individuals were less likely to be violated, for those individuals earning below the minimum, higher levels of education are not associated with lower depths of violation.

The coefficients for the age groups indicate that there is a youth bias among violating employers. Individuals in the 25-34 years experience a lower depth of violation than individuals aged between 15 and 24, as evidenced by the negative and significant coefficient. Individuals aged between 25-34 years experience a depth of violation between 25 and 26 percent lower than their younger counterparts. The results suggest that those in the 36-44 age group also experience a lower depth of violation than individuals younger than 25 years, as evidenced by the negative and significant coefficient for this variable in all specifications where included (barring Specification IV).

The level of an individual's minimum relative to the median wage in the labour market, as measured by the Kaitz index (logged), was negative and significant in all four specifications. This result shows that setting a minimum wage that is too high relative to the median not only increased the likelihood of violation, but also results in a larger depth of violation. A one percent increase in the Kaitz ratio is associated with an increase in the depth of violation of the individual of between 0.62 and 0.68%.

The results for the sectoral dummies were not significant in all four specifications, with the exception of the Civil Engineering sector. Hence, whilst most sectors were less

likely to be violated than Domestic workers, violated individuals in other sectors seem to be no worse relative to Domestic workers. On the other hand, whereas Civil Engineers are less likely to be violated than Domestic workers, the depth of violation of these individuals is significantly increased. For individuals in the Civil Engineering sector who are earning below the minimum, the depth of violation increases by between 44 and 67 percent. This finding was reflected earlier in the discussion of the rank reversals between sectors when using the different violation indices. Whilst Civil Engineering recorded the lowest V_0 measure in 2007, their depth of violation, as measured by the V_1 index, was the largest. This result shows the importance of a violation measure capturing both whether or not an individual is violated, as well as the size of their respective violation, which allows us to investigate the differences in the factors impacting on both the probability of being violated as well as the depth of violation.

The coefficient for union workers was negative and significant only in the third specification, and we conclude that union membership does not significantly impact on the depth of violation. Examining the contractual variables on the other hand, we note that a written contract results in a significantly lower violation than a non-written contract (of between 20 and 24%). An interesting result is that although the possession of a permanent contract was not a significant determinant of the likelihood of violation, it is significant in determining the depth of violation. The coefficient for permanent contract is negative and significant in all four specifications and suggests that permanent contract holders who are violated have a depth of violation between 13 and 14% lower than individuals with temporary or other contract types. The coefficient of the tenure variable is also significant and negative in all specifications. A 1% increase in tenure may reduce the depth of violation by up to 11%.

While individuals employed in formal firms were found to be equally likely to be violated as their informal counterparts, formal employment is associated with a significantly smaller depth of violation. In all specifications, the coefficients for the formal sector were negative and statistically significant, and suggest that employment in a formal firm may decrease an individual's depth of violation by 20%.

The size of the enterprise, which was found to be a significant determinant of the probability of being violated, was not found to have a significant impact on the depth of violation. The public sector/SOE variable was also not found to be statistically significant in influencing the depth of violation of an individual.

We now turn to the last set of covariates, that is, the spatial variables. The coefficient for the Area A dummy variable, which was not relevant in determining the likelihood of violation, has a significant impact in determining the depth of violation. The area A dummy therefore suggests that workers in A type areas experience a depth of violation of around 12 to 13% smaller than those in other areas. This may be a reflection of the fact that A type areas may be less remote than more rural areas, and hence may be more easily accessed by labour inspectors and enforced upon. The local unemployment rate has the effect of significantly increasing the severity of violation. A 1% increase in the local unemployment rate is associated with an increase in the depth of violation by as much as 0.52%. Hence, violated workers in district councils with high rates of unemployment are worse off than those in areas with low unemployment rates. The remaining spatial controls, namely labour participants per square mile, provincial budget, and labour centres per square mile, were not found to significantly impact on the depth of violation.

The results above showed that there are a range of variables impacting on the depth of violation of an individual, including individual characteristics such as education and age, as well as sectoral, contractual, and spatial characteristics. However, it seems that there are two classes of variables driving the depth of violation, V_1. On the one hand, firm-level and contractual factors seem to play an important role, notably the term of contract, union membership, the length of tenure, and the formality of the firm. On the other hand, the macroeconomic variables, notably the unemployment rate, play a key role. Two key results here are the lack of significance of the labour inspectorate deployed on the size of the violation, and the significant of the local unemployment rate and the ratio of the minimum wage to the median (Kaitz ratio).

V. Conclusion

This paper attempted to investigate the determinants of minimum wage violation in South Africa, a country where violation of minimum wages, at 45%, is high. In this paper we investigate the determinants of violation of minimum wage laws. Both the determinants of the likelihood of an individual being violated, as well as the determinants of the depth of violation are analysed. The results show that there are a variety of factors impacting on the probability and depth of violation, including individual, sectoral, firm-level/contractual, and spatial/density characteristics. Whilst individual characteristics such as race and gender were significant markers of whether an employee was violated or not, they were shown to be insignificant in determining the depth of violation. The key variable that emerged throughout the multivariate analysis as the crucial determinant of the level and depth of violation was the local unemployment rate. The unemployment rate was found to exert the largest influence on the depth of violation. This is an important result, indicative of the extent to which local labour market dynamics can influence compliance with minimum wage laws. Surprisingly, the number of labour inspectors was not found to significantly impact on compliance. This suggests that increasing the size of the inspectorate is an ineffective measure in order to increase compliance in South Africa, and that the solution may lie in addressing the countries high unemployment rate.

The results from this analysis carry important policy implications for South Africa. An important implication for policy is the legislated wage floor. The evidence presented in this paper shows that minimum wages in South Africa are set very high relative to the median wage in several sectors, and well above the median wage for unskilled labour. Preliminary evidence presented here suggests a positive correlation between the Kaitz index (the ratio of the minimum wage to the median) and the three measures of violation proposed, namely V_0, V_1, and V_2. A noteworthy example is the Security sector which recorded the highest measures for violation in 2007, and ironically also the highest Kaitz values. High minimum wages paired with lax enforcement and high unemployment in South Africa may be engendering high levels of non-compliance, leaving ample room for policy to intervene.

Appendix

Table 1: Sectoral determinations in South Africa

Sectoral Determination	Occupation	Area Types	Hours per week	Firm size
Farm workers	N/A	A and B	N/A	N/A
Domestic workers	N/A	A and B	> 27 hours	N/A
			< 27 hours	N/A
Farm workers	N/A	A and B	N/A	N/A
Taxi workers	Driver	N/A	N/A	N/A
	Fare Collector	N/A	N/A	N/A
Private Security	N/A	A, B, C, D, and E	N/A	N/A
Retail Sector workers	Managers	A, B, and C	N/A	N/A
	Clerks	A, B, and C	N/A	N/A
	Sales Workers	A, B, and C	N/A	N/A
	Shop Assistants	A, B, and C	N/A	N/A
	Drivers	A, B, and C	N/A	N/A
	Forklift Operators	A, B, and C	N/A	N/A
	Security	A, B, and C	N/A	N/A
Contract Cleaners	N/A	1, 2 and 3	N/A	N/A
Forestry workers	N/A	N/A	N/A	N/A
Hospitality workers	N/A	N/A	N/A	Small (<10 employees)
				Large (>10 employees)
Civil Engineers	N/A	A and B	N/A	N/A

Source: Department of Labour, South Africa

Notes: the sectoral determination covering learnerships was excluded due to a lack of information in the LFS pertaining to learners. The sectoral determination for to children working in performance arts was also excluded since children are not classified as being part of the working age population (15 to 65 years) in the LFS.

Table 2: Estimates of violation in South Africa, 2007

Sectoral Determination	V_0	V_1	V_2	V_1/V_0
Retail Sector				
Managers Area A	0.16	0.04	0.02	0.25
Managers Area B	0.08	0.03	0.02	0.38
Managers Area C	0.36	0.14	0.06	0.39
Clerks Area A	0.42	0.15	0.08	0.36
Clerks Area B	0.56	0.22	0.12	0.39
Clerks Area C	0.56	0.25	0.14	0.45
Sales Assistant Area A	0.26	0.11	0.06	0.42
Sales Assistant Area B	0.51	0.31	0.21	0.61
Sales Assistant Area C	0.32	0.26	0.21	0.81
Shop Assistant Area A	0.41	0.10	0.04	0.24
Shop Assistant Area B	0.53	0.22	0.12	0.42
Shop Assistant Area C	0.54	0.23	0.13	0.43
Drivers Area A	0.17	0.04	0.02	0.24
Drivers Area B	0.49	0.15	0.07	0.31
Drivers Area C	0.23	0.11	0.06	0.48
Forklift operators Area A	0.65	0.15	0.04	0.23
Total Retail Sector	**0.39**	**0.14**	**0.07**	0.36
Domestic workers				
Area A	0.31	0.09	0.04	**0.29**
Area B & C	0.51	0.19	0.10	**0.37**
Total Domestic Workers	**0.39**	**0.13**	**0.06**	**0.33**
Farm Workers				
Area A	0.41	0.10	0.04	**0.24**
Area B & C	0.65	0.21	0.10	**0.32**
Total Farm Workers	**0.55**	**0.17**	**0.07**	**0.31**
Forestry Workers	**0.53**	**0.16**	**0.07**	0.30
Taxi workers				
Taxi operators Drivers	0.45	0.18	0.09	0.40
Taxi operators Fare collector	0.64	0.24	0.14	0.38
Total Taxi operators	**0.47**	**0.18**	**0.09**	0.38
Security Workers				
Area 1	0.69	0.29	0.15	0.42
Area 2	0.50	0.23	0.14	0.46
Area 3	0.10	0.08	0.07	0.80
Area 4	0.63	0.25	0.12	0.40
Area 5	0.67	0.28	0.14	0.42
Total Security workers	**0.67**	**0.28**	**0.14**	0.42
Hospitality Workers				
Hospitality small firms	0.37	0.16	0.09	0.43
Hospitality med-large firms	0.25	0.08	0.04	0.32
Total Hospitality Workers	**0.29**	**0.10**	**0.05**	**0.34**
Contract cleaners				
Area 1	0.50	0.17	0.09	0.34
Area 2	0.52	0.19	0.10	0.37
Area 3	0.35	0.13	0.07	0.37
Total Contract cleaners	**0.44**	**0.16**	**0.08**	0.36
Civil engineering	**0.09**	**0.04**	**0.02**	0.44
Total	**0.45**	**0.16**	**0.08**	**0.36**

Source: Authors' calculations using LFS September 2007 (StatsSA) and ECC sectoral determinations.

Table 3: Estimates of the Kaitz Index, 2007

Sectoral Determination	2007					
	K_1(w_M/ median salaried)		K_2 (w_M/ $w_{median\ group}$)		w_M/ median unskilled	
Retail	0.92	(2)	0.92	(5)	2.30	(2)
Domestic	0.33	(9)	0.96	(4)	0.82	(9)
Farm workers	0.43	(7)	1.13	(2)	1.07	(7)
Forestry	0.38	(8)	1.06	(3)	0.96	(8)
Taxi	0.70	(4)	0.88	(7)	1.75	(4)
Security	1.06	(1)	1.40	(1)	2.66	(1)
Hospitality	0.58	(6)	0.73	(8)	1.45	(6)
Contract cleaning	0.63	(5)	0.91	(6)	1.57	(5)
Civil engineering	0.82	(3)	0.22	(9)	2.05	(3)
Total	**0.61**	...	**1.17**	...	**1.52**	...

Source: Authors' calculations using LFS September 2007 (StatsSA) and ECC sectoral determinations.
Notes: 1. The Kaitz ratio is computed as the ratio of the mean adjusted minimum wage in each sector-occupation-location cell to the median wage of all salaried workers (that is, excluding self-employed workers). The ratio of the minimum wage to the group median is the ratio of the minimum wage by sector, occupation, and location to the median wage in each sector-occupation-location category.
2. Unskilled workers include Elementary workers and Domestic workers.
3. All estimates are for the weighted sample.
4. Ranks are shown in parentheses.

Table 4: Spearman's Rank Order Correlation between Kaitz index and Violation Indices, 2007

	Coefficient Kaitz 1 (w_M/median salaried)	Coefficient Kaitz 2 ($w_M/w_{median\ group}$)
V_0 and Kaitz	0.4408*	0.8897*
V_1 and Kaitz	0.4905*	0.8939*
V_2 and Kaitz	0.5231*	0.8677*

Source: Authors' calculations using LFS September 2007 (StatsSA) and ECC sectoral determinations.
Note: * indicates statistical significance at 1*, ** indicates statistical significance at 5%, *** indicates statistical significance at 10%.

Table 5: Summary Statistics

	Variable	Mean	Std. Dev.
Individual	White	0.0513	0.2206
	Coloured	0.2199	0.4142
	Asian	0.0168	0.1286
	Female	0.4770	0.4995
	English	0.0419	0.2004
	None to Grade 8	6.3215	2.6483
	Grade 9-11	1.2678	1.3610
	Grade 12	0.2462	0.4308
	Diploma	0.0346	0.1828
	Degree	0.0127	0.1590
	25-34 years	0.3134	0.4639
	35-44 years	0.2665	0.4421
	45-54 years	0.1912	0.3933
	55-65 years	0.0860	0.2804
	Kaitz ratio	0.5709	0.2965
Sectoral	Farm	0.2897	0.4537
	Retail	0.1754	0.3803
	Forestry	0.0262	0.1597
	Taxi	0.0397	0.1953
	Security	0.0810	0.2728
	Hospitality	0.0682	0.2521
	Contract Cleaning	0.1360	0.3428
	Civil Engineering	0.0035	0.0593
Firm-level/Contractual	Union member	0.1869	0.3899
	Written contract	0.6115	0.4874
	Permanent contract	0.6835	0.4651
	Tenure	5.7446	7.4525
	Formal sector	0.6628	0.4728
	Semi-formal	0.7457	0.4355
	Small firm	0.2807	0.4494
	Medium firm	0.1672	0.3732
	Medium-Large firm	0.1844	0.3878
	Public sector	0.0717	0.2581
Spatial density/ Enforcement	Area A	0.6143	0.4868
	Labour force per mile^2	276.37	685.84
	Inspectors per 100,000	1.5560	0.8466
	Non- Inspectors per 100,000	3.9468	1.4028
	Local unemployment rate	0.3599	0.1095
	Provincial budget	52,100,000	20,600,000
	Labour centres per mile^2	0.0006	0.0011

Source: Own calculations using LFS September 2007, StatsSA.

Notes: Only workers covered by the Department of Labour (DoL) sectoral determinations were included in the sample. The self-employed were not included in the sample since they pay their own wages. Small firms are those with less than 9 employees, medium firms are those with less than 19 employees, medium-large firms refers to enterprises with less than 50 employees, and large firms are those with 50 employees or more

Table 6: The number of non-inspectors as a predictor of the number of labour inspectors

Dependent variable inspectors per capita (logged)	I	II	III	IV
Non-inspectors per capita (logged)	2.0927***	1.1536***	1.1942***	1.9945***
	(0.0479)	(0.0359)	(0.0375)	(0.057)
Individual controls included	No	Yes	No	Yes
Sectoral controls included	No	Yes	Yes	Yes
Firm level/Contractual controls included	No	Yes	Yes	Yes
Spatial controls included	No	Yes	Yes	No
Observations	8,211	6,190	6,226	6,190
R-squared	0.4415	0.7305	0.7171	0.4753
F-statistic	1909.04	205.41	290.13	54.69

Source: Results using Labour Force Survey September 2007 (Statistics South Africa) and data provided by the Department of Labour on the labour inspectorate and provincial budget.

Notes: Standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%. The table reports the least squares estimates of a regression of the log of the number of labour inspectors per 100,000 people in a province on the log of the number of non-inspectors per 100,000, and individual, sectoral, firm-level, and spatial controls. Robust standard errors are shown in parentheses. The F-statistic tests the hypothesis that the non-inspectors coefficient is zero. Results are for the weighted sample of covered, non-self-employed individuals only.

Table 7: Results from violation probit

	Dependent variable= V_0	I	II (2SLS)	III (2SLS)	IV (2SLS)
Individual	White	-0.389***	-0.386***	...	-0.388***
	Coloured	-0.130***	-0.105**	...	-0.114***
	Asian	-0.0988	-0.113	...	-0.0553
	Female	0.154***	0.150***	...	0.149***
	English	-0.266***	-0.272***	...	-0.279***
	None to Grade 8	-0.0202***	-0.0197***	...	-0.0216***
	Grade 9-11	-0.0454***	-0.0458***	...	-0.0481***
	Grade 12	-0.0419	-0.04	...	-0.0441
	Diploma	-0.191***	-0.194***	...	-0.163***
	Degree	-0.116*	-0.114*	...	-0.116*
	25-34 years	0.0126	0.0167	...	0.027
	35-44 years	-0.0676	-0.0625	...	-0.055
	45-54 years	-0.108**	-0.1000**	...	-0.0938**
	55-65 years	-0.0852	-0.0758	...	-0.0635
	Kaitz ratio	0.561***	0.558***	0.473***	0.519***
Sectoral	Farm	0.0438	0.0435	0.00155	0.0313
	Retail	-0.251***	-0.239***	-0.399***	-0.271***
	Forestry	0.0968	0.0743	0.00913	0.0667
	Taxi	-0.150**	-0.143**	-0.277***	-0.182***
	Security	-0.0101	-0.00727	-0.131**	-0.0529
	Hospitality	-0.237***	-0.231***	-0.315***	-0.260***
	Contract Cleaning	-0.123**	-0.113*	-0.144**	-0.167***
	Civil Engineering	-0.291***	-0.285***	-0.407***	-0.303***
Firm-level/Contractual	Union member	-0.119***	-0.119***	-0.119***	-0.102***
	Written contract	-0.0949***	-0.0952***	-0.0981***	-0.0943***
	Permanent contract	-0.0919***	-0.0887***	-0.114***	-0.0872***
	Tenure	-0.0583***	-0.0596***	-0.0629***	-0.0645***
	Formal sector	0.00271	0.00521	-0.00119	0.0144
	Semi-formal	-0.0629	-0.07	-0.0726	-0.0857
	Small firm	0.111***	0.112***	0.127***	0.125***
	Medium firm	0.165***	0.163***	0.158***	0.164***
	Medium-Large firm	0.0528	0.0481	0.051	0.0526
	Public sector	-0.181***	-0.181***	-0.173***	-0.167***
Spatial density/ Enforcement	Area A	0.0187	0.0346	0.00362	...
	Labour force per mile^2	-0.0108	-0.0143	-0.0209**	...
	Inspectors per 100,000	0.00423	-0.0732	-0.0431	-0.0404*
	Local unemployment rate	0.187***	0.121**	0.195***	...
	Provincial Budget	-0.000189	-0.16	-0.122	...
	Labour centres per mile^2	-0.0361	0.0131	0.0333	...
	Observations	6,190	6,190	6,218	6,190
	Predicted probability	0.4032	0.4035	0.4298	0.4048

Source: Own calculations using LFS September 2007, Statistics South Africa. Inspectorate data from DoL (South Africa).
Notes: Marginal effects reported. *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors used. The number of labour inspectors per 100,000 people is instrumented by the number of non-inspectors per 10,000 people in Specifications II-IV. All non-categorical variables were logged.

Table 8: Regression on V_1

Dependent variable = V_1 (logged)		I(OLS)	II(2SLS)	III(2SLS)	IV(2SLS)
Individual	White	-0.0331	-0.0334	...	-0.0665
	Coloured	-0.0893	-0.0773	...	-0.194
	Asian	0.581*	0.573*	...	0.591*
	Female	0.0847	0.0834	...	0.0807
	English	-0.530**	-0.537**	...	-0.553**
	None to Grade 8	-0.0188	-0.0186	...	-0.0209
	Grade 9-11	-0.0694	-0.0691	...	-0.0731
	Grade 12	0.0937	0.0938	...	0.0927
	Diploma	-0.165	-0.163	...	-0.0847
	Degree	-0.151	-0.143	...	-0.178
	25-34 years	-0.261***	-0.260**	...	-0.248**
	35-44 years	-0.196*	-0.195*	...	-0.171
	45-54 years	-0.0966	-0.0934	...	-0.0704
	55-65 years	-0.163	-0.161	...	-0.151
	Kaitz ratio	0.680***	0.679***	0.620***	0.628***
Sectoral	Farm	-0.00649	-0.0072	-0.022	-0.0333
	Retail	-0.175	-0.173	-0.265	-0.2
	Forestry	-0.132	-0.141	-0.129	-0.153
	Taxi	-0.129	-0.126	-0.258	-0.133
	Security	0.171	0.17	0.0593	0.0949
	Hospitality	-0.00375	-0.00421	-0.0934	-0.0279
	Contract Cleaning	0.0489	0.052	0.0448	-0.0399
	Civil Engineering	0.674***	0.658***	0.442**	0.649***
Firm-level/Contractual	Union member	-0.116	-0.115	-0.160*	-0.105
	Written contract	-0.214**	-0.214**	-0.236***	-0.200**
	Permanent contract	-0.136*	-0.134*	-0.145*	-0.137*
	Tenure	-0.104***	-0.104***	-0.0777**	-0.109***
	Formal sector	-0.181***	-0.180***	-0.204***	-0.182***
	Semi-formal	-0.128	-0.129	-0.126	-0.149
	Small firm	0.0233	0.0243	0.00549	0.0364
	Medium firm	0.0313	0.0316	0.013	0.0207
	Medium-Large firm	-0.00409	-0.00777	6.66E-05	-0.0176
	Public sector	-0.103	-0.104	-0.0935	-0.0677
Spatial density/ Enforcement	Area A	-0.132**	-0.124**	-0.128**	...
	Labour force per mile^2	0.0028	0.000495	-0.00253	...
	Inspectors per 100,000	0.106*	0.0723	0.111	-0.0178
	Local unemployment rate	0.452***	0.426***	0.523***	...
	Provincial Budget	0.0513	-0.017	0.00412	...
	Labour centres per mile^2	-0.00644	0.0152	0.0294	...
Constant		-0.584	0.776	0.323	-0.1
Observations		2,777	2,777	2,786	2,777
R-squared		0.134	0.134	0.115	0.119

Source: Own calculations using LFS September 2007, StatsSA.
Notes: Marginal effects reported. *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors used. The number of labour inspectors per 100,000 people is instrumented by the number of non-inspectors per 10,000 people in Specifications II-IV. All non-categorical variables were logged.

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