Small firm employment and minimum wages: the role of international markets

by

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Abstract

This paper measures the impact of South African minimum wages on small and large firm employment in a sector that is exposed to international competition (agriculture) and one that is not (retail). Our results highlight that small firms in export-orientated sectors are the most vulnerable to minimum wage legislation. In particular, small farms shed jobs, while larger farms employed more unskilled workers. While this shift represents a short-run response to minimum wages it intensifies a long-run movement towards fewer, larger, more capital-intensive farms. Large farms build their success on exports; small farms are unable to access international markets in the same way. Wage increases can therefore not be transferred by small farmers to consumers. Retail firms do not exhibit the same behaviour, with zero employment losses in both small and large firms. We argue that agriculture's dependence on export markets makes small firms particularly vulnerable to international competition. Wage pressure adds to this stress. Consequently, small farming operations become unviable. The result is that intra-industry concentration and inequality could grow in response to an undifferentiated national minimum wage. This is true even if the economy-wide impact of a national minimum wage could be potentially benign.

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1. Introduction

Within the context of high inequality *among* wage earners (Leibbrandt *et al.*, 2009) and large numbers of working poor (Vermaak, 2012), South African policy makers have recently approved the implementation of a national minimum wage from May 2018. Other developing countries with similar socio-economic challenges (notably in the BRICS bloc, of which South Africa is also a member), have successfully followed this approach to reduce inequality (Lustig *et al.,* 2013).

Currently, minimum wages are implemented selectively and differentially in South Africa, catering for the specific circumstances of sectors, regions and firm sizes[3]. While exemptions in some sectors and lower floors in others may minimize employment losses, the many details of sector-specific legislation introduce administrative burdens on employers. Bhorat *et al.* (2012) emphasise that low compliance in paying minimum wages may result from the complex minimum wage structure that exists in South Africa[4]. A national minimum wage has the potential to partially remedy the problem of non-compliance. Developed countries, such as Germany, have also recently harmonized sector-specific minimum wages into one economy-wide wage-setting framework. This transition has, however, reduced employment levels somewhat (Bossler & Gerner, 2016).

South Africa's dual imperative of employment creation and inequality reduction introduces a policy tension: minimum wages potentially exert opposite pressures on both outcomes. A "blanket approach" – as embodied by a national minimum wage – could be beneficial for large-scale inequality reduction; a sector-specific approach could take into account vulnerabilities that result in job losses in some segments of the economy. In this paper we evaluate the current sector-specific approach, and focus on the experience of small firms – especially when these small firms operate in a sector that is very open to international trade. Magruder (2012) provides evidence that small

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[3] Currently two independent mechanisms determine minimum wages. Sectoral determinations are legislated directly by central government, but only in selected sectors that employ the poorest workers in the labour market (such as agricultural, retail and domestic employees). Collective agreements, on the other hand, are agreed upon by industry bargaining councils – a collective of union representatives and firms who negotiate wages of better-paid workers (such as metal and clothing workers). These agreements can be extended to uncovered firms within the same sector and jurisdiction at the discretion of the Minister of Labour, regardless of whether employers and employees in these firms were party to the original agreement. These industry agreements, therefore, function in the same way as a conventional minimum wage. However, many workers are still not covered by either of these two mechanisms.

[4] South Africa has 124 different minimum wage structures (Cassim, Jourdan & Pillay, 2015).

firm employment is already particularly low in South Africa, and declines in response to prescribed wage levels in the manufacturing sector. While the current policy framework for a new national minimum wage acknowledges these vulnerabilities, exemptions for small enterprises will only be temporary (Republic of South Africa, 2016).

This paper analyses the effect of minimum wages by firm size in the agricultural and retail sectors. The agricultural sector in South Africa relies on international export markets; however, only operators with economies of scale and complementary capital can be successful in gaining access to international markets (in other words, mostly only larger farms are viable). By contrast, the retail sector is closed to external markets. Our aim is to assess whether scale economies in the ability to absorb legislated wage increases arise in the agricultural sector, a sector vulnerable to fluctuations in international trade, and whether – in contrast - small players in the retail sector (that is not as sensitive to the external environment) are immune to legislated wage-setting.

Our results show that most of the disemployment effects resulting from the introduction of minimum wages in the agricultural sector were concentrated on small farms. Large farms, in stark contrast, experienced employment growth. Small farms could not absorb the higher wage costs effectively, while large farms benefitted from the small farms' losses. This reflects a long-run trend whereby the number of commercial farmers has declined, but their scale has increased as a necessary response to greater exposure to international trade volatility (Liebenberg & Pardy, 2012). Minimum wages have, therefore, intensified an existing vulnerability. In contrast, the sensitivity of small firm employment is not apparent in the non-tradable retail sector that is relatively immune to international economic conditions.

Section two of this paper reviews international empirical evidence on the relationship between minimum wages and employment outcomes and discusses heterogeneous impacts of minimum wages on different sectors (tradable and non-tradable) and within sectors (between small and large firms). Section three introduces the dataset and key variables and discusses the estimation strategy and descriptive statistics. Thereafter, econometric results are presented. In the last section, the paper is concluded and policy implications are discussed.

2. Literature review

The impact of minimum wages on employment is perhaps one of the most studied and controversial topics in economics. Models of a perfectly competitive labour market predict that the introduction of minimum wages decrease employment (if the minimum wage is binding). However, if a monopsonistic labour market is assumed to hold, the effect of a minimum wage could either increase or decrease employment. It is therefore unclear whether minimum wages affect employment in the same manner across sectors and firm size. The international and South African empirical evidence highlights these potential differences, and is discussed below.

2.1 Evidence of the impact of minimum wages

Research on the effect of minimum wages on employment outcomes is vast and spans over many decades. Brown *et al.* (1982) reviewed the first wave of the minimum wage literature and found that teenage employment elasticities (the percentage change in employment for a 1 per cent increase in wages) ranged between -0.1 and -0.3. Until the early 1990s, the consensus was that a robust negative relationship between minimum wages and employment existed. This position was challenged by the results of Card (1992a, 1992b), Katz and Krueger (1992), and Machin and Manning (1994) (*inter alia*), signaling the emergence of the new minimum wage literature and required updated theoretical perspectives. Card and Krueger's (1994) seminal study analysed the increase in minimum wages in New Jersey, and found – contrary to expectations – a very large positive effect on employment levels. However, in 2000 Neumark and Wascher reassessed these findings using payroll data and found elasticities ranging between -0.10 and -0.25. In response to Neumark and Wascher's (2000) findings, Card and Krueger (2000) used data from the US Bureau of Labour Statistics to re-estimate the effect of minimum wages on employment in New Jersey's fast food restaurants and found a small but insignificant effect on employment. Perhaps an explanation for why the three papers found such different results (while studying the same geographical areas and types of restaurants), could be due to the different datasets used and measurement error.

Due to a lack of consensus about the relationship between minimum wages and low-wage employment, Neumark and Wascher (2007) conducted a meta-analysis of more than 100 studies. The majority found disemployment effects. Two recent revisionist studies by Allegretto *et al.*

(2011) and Dube *et al.* (2010) found no disemployment effects as a result of minimum wage increases in the United States. However, Neumark *et al.* (2014) again reviewed these two studies and instead found significant elasticities of -0.1 and -0.2.

Recently, Sorkin (2015) found that demand for labour is inelastic in the short run, but is elastic in the longer-term as employers can substitute away from labour towards capital. In line with this finding, Meer and West (2015) demonstrated the impact of minimum wages on employment and changes in employment growth over time. The authors discovered that minimum wages decrease employment *growth* and employment levels over a longer time period, instead of instantaneously.

The minimum wage literature in developing countries is scarcer and more recent. Fajmzylberg (2001) studied employment elasticities for Brazil and estimated them to be in the range of -0.05 and -0.08. Bell (1997), Maloney and Mendez (2004) and Arango and Pachon (2007) analysed elasticities for Columbia and found them to be between -0.02 and -0.12. Gindling and Terrell (2005, 2007) looked at an increase in minimum wage in Costa Rica and found that affected employers responded both at the extensive and intensive margin, by reducing employment by 1.09% and hours worked by 0.6% respectively.

Sectoral minimum wages were first introduced in South Africa in 1999, so that the evidence remains limited. In a pre-emptive simulation paper, Bhorat (2000) investigated the potential employment effects of the introduction of minimum wages for domestic and farm workers. The paper showed that employment would decrease as a result of the introduction of minimum wages. Studies by Conradie (2004) and Hertz (2005) confirmed the simulation results, both indicating that employment decreased for agricultural and domestic workers in response to the introduction of minimum wages in 2003. Conradie (2004) analysed the response of 190 grape farmers and estimated an employment decrease between 3% and 6% as the minimum wage increased by 10%. Hertz (2005) found that, while total earnings increased for domestic workers, the estimated employment elasticity for domestic workers was -0.46.

In contrast, a case study of 103 farm workers in the sugar industry by Murray and van Walbeek (2007) found no large reduction in employment. Instead, employers reduced the number of hours worked to afford the higher labour costs.

Dinkelman and Ranchhod (2012) use a difference-in-difference model to analyse how employment and hours worked changed for domestic workers between 2001 and 2004, and found no reduction in the number of workers nor in hours worked. Bhorat *et al.* (2013) were the first to analyse employment outcomes in the retail, taxi, forestry and private security sectors, using a similar approach to that of Dinkelman and Ranchhod. While the authors found no significant impact of the laws at the extensive margin for any of the sectors, their results suggest that the retail, security and taxi sectors decreased working hours to afford the higher wage costs. Furthermore, Bhorat *et al.* (2013) found that real wages increased in four out of the five sectors analysed, as a result of the introduction of minimum wages. The research by Bhorat *et al.* (2014) studied the effect of the agricultural minimum wage on employment, wages and hours worked between 2000 and 2007. Their results indicate that employment decreased, while wages and hours worked increased in response to the introduction of minimum wages. Garbers (2014) analysed the effect of the agricultural minimum wage on employment from 1997 to 2007, using a fixed effects approach, and estimated employment elasticities for unskilled workers of -1.5.

In sum, where minimum wages did have disemployment effects in South Africa, the elasticities are large compared to other developing countries. Yet, in many sectors the effects are zero. Minimum wages therefore have heterogeneous, sector-specific impacts. This paper is one of the first to understand the circumstances in which these differences arise. Two types of heterogeneity are discussed below: heterogeneity between sectors, (specifically between tradable and non-tradable sectors,) and heterogeneity within sectors, (between small and large firms).

2.2 Differences in the impact of minimum wages in tradable and non-tradable sectors

A potential reason for cross-sectoral differences is that retail, private security and the taxi sectors are non-tradable: this implies that these sectors do not generally rely on exports. On the contrary, agriculture and the clothing industry produce goods that are tradable and thus face international competition. Therefore, when minimum wages are introduced and increase labour costs, the ability of producers to pay higher wages differs between the tradable and non-tradable sectors. Since firms in non-tradable sectors face no international competition, they can raise prices and shift the burden of higher labour costs onto the consumer. Consequently, there is no need to shed employment. On the contrary, firms in tradable sectors face international competition, and can therefore not shift the burden of higher labour costs onto the consumer. Therefore, when minimum wages are

introduced in tradable sectors, firms often have to decrease employment or even exit as they cannot pay the higher wage costs.

Findings by Fedderke *et al.* (2006) support this reasoning. They investigated mark-ups in the South African manufacturing industry and found that import and, to a lesser extent, export penetration lead to lower mark-ups. This emphasizes that tradable sectors which face international competition cannot increase prices in response to higher wage costs. Moreover, research by Rankin (2016) shows that small firms in the manufacturing sector, a tradable sector, are especially vulnerable. He notes that when small firms which employ more low-skilled labour intensive workers are confronted with pressure on wages, this pressure is exacerbated when the sector faces higher levels of import competition and often causes these small firms to exit.

This sub-section has shown that in the presence of wage increases, the response of firms is very different, depending on whether they are in a tradable or non-tradable sector. In addition, research by Rankin (2016) has pointed out that in particular small firms in a tradable sector are particularly vulnerable. The next sub-section discusses how small and large firms are affected differently by minimum wages.

2.3 Differences in the impact of minimum wages on small and large firms

Rama (2001) argues that for large firms, the monopsonistic model of minimum wages is more accurate whereas the competitive model is more applicable to small and medium sized firms. Firms of different sizes therefore respond inherently differently to the introduction of minimum wages. Indeed, Rama (2001) found that employment effects differed by firm size in Indonesia. Small firms experienced significant employment losses (as predicted by the competitive model), whereas large firms experienced an increase in employment (possible only with the monopsonistic model). This suggests that in certain circumstances small firms can be losers, whereas large firms can be winners from minimum wages. This is in line with research by Del Carpio *et al.* (2012) who found negative employment effects for small firms in the manufacturing sector in Indonesia, whilst large firms did not experience disemployment effects.

Parrott (2004) used state-level differences in the minimum wages in the United States, to compare the impact of minimum wages on small firms. Based on descriptive statistics, the author concluded that small firms in states that introduced a minimum wage above the federal minimum, had higher

employment and wage growth. As a result, he concluded that small firms are not particularly negatively affected by minimum wages. Sabia (2006), however, pointed out that Parrott (2004) neither tested for statistical significance, nor did he control for confounding factors – such as socioeconomic and demographic factors. Sabia used econometric techniques and estimated that a 10% increase in the minimum wage, decreases employment in small firms by 0.8-1.2%. The author found an even bigger disemployment effect when looking at low skilled workers in small firms, where employment elasticities ranged between -0.48 and -0.88.

Although the South African literature on the impact of sectoral minimum wages (as institutionalised by sectoral determinations) on small firms is somewhat silent, Magruder (2012) analysed the impact of bargaining councils that extend their collective agreements to small firms. Magruder found that bargaining councils reduced small firm employment by 7-16% while there was no effect on large firms.[5]

This evidence presented by Magruder (2012) points towards a feature of South African market structure: high levels of concentration exist, large firms dominate the market and are more immune to policy changes than small firms. In addition, Kerr *et* al. (2014) found that all net job creation in South Africa (and the manufacturing sector) occurred within larger firms. In addition, Matthee *et al.* (2015) showed that South African exports are dominated by a group of larger 'super-exporters'. Furthermore, Edwards *et al.* (2017) show that only the most productive firms are able to export. Ultimately, these are firms which use the most productive inputs, capital and better-skilled workers- mainly found in larger firms. Economies of scale and an export orientation are therefore essential for success.

The evidence presented above has shown that tradable sectors are more vulnerable to minimum wages, which often result in job losses or an exit of firms. Furthermore, small firms have been shown to be more vulnerable to collectively bargained wages than large firms. We formally highlight these differences by studying small and large firms in an export-orientated sector compared to a sector that is not open to international trade.

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[5] Small firms are defined by the author as less than 10 employees and large firms defined as more than 20 employees.

3. Data and estimation strategy

3.1 The data

The dataset used is comprised of 15 waves of the South African Labour Force Survey (LFS), from September 2000 to September 2007. The LFS is nationally representative and surveyed approximately 30 000 households in each installment. Surveys were conducted in March and September of each year by Statistics South Africa. The waves were pooled and treated as repeated cross sections over time. The sample was restricted to the working age population, while self-employed individuals as well as union and government workers were excluded from the sample[6].

Sectoral determinations are set by the Minister of Labour and are published in Government Gazettes[7]. These sectoral determinations are set for specific groups of individuals and stipulate conditions of work, including minimum wages. The South African Standard Classification of Occupations (SASCO) and the International Standard Industrial Classification (ISIC) are reported in the LFS, and were used to identify minimum wage workers.

When the agricultural minimum wage was introduced in March 2003, it varied by geographical locations articulated as areas A and B. Areas A and B were defined at a local municipality level, where area A represented more affluent local municipalities (and as a result had higher legislated minimum wages), while area B comprised of poorer and often more rural local municipalities (and thus had lower legislated minimum wages).

Complex minimum wage structures were introduced on 1 February 2003 in the retail sector, which not only varied by geographical regions; A, B and C, but according to occupation type and part- or full-time working status. In addition, firms with less than five employees paid a lower minimum wage than firms with five or more employees. This concession was removed by 2006.

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[6] Union and government workers were excluded from the sample since their wages are often subject to collective bargaining agreements and including them would have confounded the two types of wage legislation.
[7] These are available on the Department of Labour's website, www.labour.gov.za.

3.2 Sample selection and key variables

The construction of treatment and control groups was guided by the analysis of Bhorat *et. al.* (2013; 2014). The entire dataset was restricted to low-wage individuals[8] in the working age population, who had less than 12 years of education[9]. Individuals who indicated that they worked more than 15 hours a day, as well as those who reported zero wages or had missing wages were not included in the sample.

Two unique control groups[10] for both the agricultural and retail sectors were created to see if minimum wage impacts were unique to workers in these sectors. Control groups for the respective sectors were chosen based on having similar characteristics to the respective treatment groups. In particular, the agricultural sector control group (for the hours worked and wage analysis) was restricted to elementary workers. Furthermore, the control group for the hours worked and wage analysis for the retail sector comprised of individuals in semi-skilled occupations. Importantly, any individuals in semi-skilled occupations that are affected by another minimum wage are not included in the control group.

The control group used in the employment analysis for the agricultural sector consists of African and mixed race[11] individuals who were either employed or narrowly unemployed. For employed individuals, only those in elementary occupations are included. The retail sector's control group for the employment analysis, comprised of employed and narrowly unemployed individuals[12]. Using broader control groups acknowledges that workers who have lost their jobs in the minimum wage sector could potentially find employment in another sector, or become unemployed. These control groups, therefore, include workers employed in other sectors and workers affected by other minimum wages.

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[8] Defined as earning below R10 000 per month in 2000 Rands.

[9] This was done as minimum wages usually affect the low-wage and low-skilled workers the most and not the relatively more educated and better paid in each sector.

[10] One control group for the employment analysis and another control group for the hours worked and wage analysis.

[11] Since the majority of farmworkers are African and of mixed race, the control group was restricted to these race groups to make the control group as similar to the treatment group as possible. It is furthermore known that different wage-determination processes operate for various race groups (Burger et al, 2016).

[12] The employed people in this control group were not restricted by specific skill-levels, since the retail treatment group also included occupations over a range of different occupations and skill-levels.

3.3 Estimation strategy

The estimation strategy used in this paper is based on the classic Card and Krueger (1995) model. Two different specifications are used:

(1) $Y_{ijkt} = \beta_0 + \beta_1 Post_t + \beta_2 Sector_k + \beta_3 Post_t * Sector_k + \emptyset_j + \varepsilon_{ijkt}$

(2) $Y_{ijkt} = \alpha_0 + \alpha_1 Post_t + \alpha_2 Wage\ gap_{jk} + \alpha_3 Post_t * Wage\ gap_{jk} + X_{ijkt} + \gamma_{ijkt}$

Specification (1) is the standard difference-in-differences model, where Y_{ijkt} is the outcome of interest, hours worked and wages, for individual i in sector k, district council j and period t. The $Post_t$ variable is a dummy which takes on a one in the periods after the introduction of minimum wages, and zero for all periods before the introduction of the minimum wage laws. The $Sector_k$ variable is a dummy variable and takes on a one if the individual is in the treated sector, and zero if the individual is in the control group. The interaction term, $Post_t$*$Sector_k$ is the difference-in-difference term. Its coefficient represents the causal effect of the minimum wage.

This specification is estimated with and without individual controls and district council fixed effects. Although control groups were chosen specifically to have similar characteristics as the treated group, there are limitations to this identification strategy. One such limitation is that there might be spillover effects from treated to untreated sectors; for instance, workers in the treated sector might become unemployed after the introduction of minimum wages and then find employment in the untreated sectors (Gindling & Terrell, 2005, 2007). Thus, this specification might overestimate the effects of the law in the treated sectors. In response to this limitation, specification (2) does not use a control group to estimate the effect of the laws, therefore no spillover effects can occur. Specification (2) is thus the preferred specification. Aditionally, this specification also allows for the estimation of employment effects.

The second specification is based on Card and Krueger (1995) and Lee (1999). It tests whether employment, hours worked and wages increased more in areas where wages were lower in the pre-law period – in other words, where treatment intensity would have to be higher to comply with minimum wage legislation. $Post_t$ is a time dummy variable, as described above. The $Wage\ gap_{jk}$

variable measures the intensity of the introduction of minimum wages across the district councils[13], based on initial wages in the period prior to the introduction of the law. The variable then, distinguishes between regions where wages had to rise the most to reach full compliance (and by implication would have the largest adjustments to local labour market outcomes – if indeed they took place), and is constructed as follows:

$$Wage\ gap_j = \log[minimum(W_j^*)] - \log[median(W_j')]$$

W_j^* is the initial minimum wage in $district_j$ and W_j' is the median wage of the treated sector in $district_j$, in the year before minimum wages were implemented (2002)[14]. The wage gap variable takes on a zero for district councils where the median wage is higher than the minimum wage. To construct the wage gap variable, each individual in the dataset had to be assigned the hourly real minimum wage for the district council they reside in[15]. However, minimum wage regions (areas A and B) are defined by smaller municipal demarcations which cannot be identified in the data. Larger district councils are, however, the smallest demarcation that can be consistently identified throughout the period of analysis. A district council could therefore comprise of only area A municipalities, only area B municipalities or a mixture of area A and area B municipalities[16]. Assigning minimum wages to individuals living in district councils comprising only of areas A or B is uncomplicated. For district councils that contain both areas, assigning a minimum wage is more complex. Population estimates from the 2007 Community Survey were used to see what percentage of the district councils' populations lived in local municipalities classified as A or B. These percentages were then assigned to each individual in the dataset depending on the district council in which the individual resided. Minimum wages for mixed district councils were then calculated as follows:

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[13] South Africa is divided into 55 district councils. Minimum wages do not vary greatly by geography, except where these districts contain greater numbers of workers in either area A or B municipalities (which are smaller geographic units than district councils).

[14] Both the median and minimum wages are real hourly wages in 2000 Rands.

[15] All minimum wages were adjusted for inflation and converted into 2000 Rands, using CPI data from StatsSA.

[16] Determining whether a district council comprised of only areas A or B or a mixture was done by looking up which local municipalities fell under which district councils on the government's website.

*E(Minimum wage)ⱼ = % of people living in area A * area A minimum wage + % of people living in area B * area B minimum wage.*[17]

Each individual is assigned this weighted minimum wage according to their district of residence. This was then used to construct the wage gap variable, so that the impact of minimum wages on employment outcomes could be analysed. A similar method was followed for the retail sector, the main difference being that the retail minimum wage varied across three areas instead of two.

The coefficient on the interaction term (α_3) in specification (2) measures the change in outcomes attributable to the minimum wage in the post-law period. The second specification is run on the treatment and control groups for the employment analysis but is restricted to only the treated in the hours worked and wage analysis. This specification is run with and without individual controls and district council fixed effects.

3.4 Descriptive statistics

Table 1 shows the average characteristics for the agricultural and retail sectors, as well as its unique control groups over the entire sample period. Looking at the first part of table 1, one sees that, on average, agricultural workers were more likely to be largely African, middle aged, males with very low levels of education (roughly five years of schooling). Real hourly wages in the agricultural sector decreased slightly between 2000 and 2002, after which they increased continually until 2007. This indicates that minimum wages did indeed raise farmworker wages. The number of hours worked by farmworkers decreased from 2000-2007, with a substantial decrease from 2002 to 2003, when the minimum wage was introduced. This suggests that employers may have adjusted on the intensive margin to be able to afford the higher labour costs.

Looking at the average characteristics in the retail sector, one can see that, on average, workers in the retail sector had around 10 years of schooling[18], and were also middle-aged African

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[17] To clarify, each mixed district council would have a different minimum wage, depending on how many people in that district council lived in local municipalities A or B.

[18] As mentioned previously, the retail minimum wage ranges across certain occupations, including managers. Since managers are often relatively more educated and remunerated, another treatment group was created to see whether mean characteristics of the treatment group changed. Regressions with this treatment group were also run, but as with the mean characteristics, there were no substantial differences. For future research, one could perhaps split the retail minimum wage into a relatively more skilled and relatively less skilled groups, to get better control groups.

individuals. Real wages in the retail sector increased from 2002 to 2007, which could imply that there was at least partial compliance with minimum wage legislation in the retail sector. In response to the higher wages, it does not seem that employers reduced the number of hours worked, as average hours worked remained relatively constant over the sample period, with small fluctuations around 49 hours a week.

Table 2 shows the average wage gap for the agricultural and retail sectors across different firm sizes. The wage gap variable measures the potential intensity of compliance with minimum wage legislation, based on median wages of workers in the year prior to the introduction of minimum wages. The higher the wage gap, the more wages needed to increase to comply with the minimum wage legislation. The average wage gap in the agricultural sector was 0.47. In other words, minimum wages were set at a level that is nearly 50% higher than the median agricultural wage in each district. Notably, wage gaps only start to narrow noticeably for farms that employ 50 workers and more; large farms already had the greatest capacity to pay minimum wages before they were imposed. Turning to the retail sector, the wage gap of 0.23 is substantially lower than in the agricultural sector, indicating that the minimum wage was more binding in the agricultural sector than in the retail sector. Moreover, the wage gap is substantially higher for the firms with less than 5 employees than, than for firms with 5 employees or more. This was despite the fact that a higher minimum wage was imposed for the latter group.

Table 1: Mean characteristics of the agricultural and retail sectors and their control groups

	2000	2001	2002	2003	2004	2005	2006	2007
Agriculture sector								
Number of agriculture workers	1283	2857	3096	2810	3021	3011	3121	3045
Average education	4.92*	4.88*	4.98*	5.15*	5.21*	5.55*	5.58*	5.77*
Average age	35.22	35.74*	34.97	35.10*	35.26	35.04*	35.06*	35.35*
Proportion African	0.61*	0.66*	0.66*	0.63*	0.67*	0.69*	0.68*	0.70*
Proportion male	0.65*	0.67*	0.65*	0.66*	0.66*	0.67*	0.63*	0.66*
Average hours worked last week	51.68*	50.73*	51.62*	49.88*	48.86*	49.59*	49.12*	48.59*
Real hourly wage (2000 Rands)	2.56*	2.56*	2.35*	2.68*	3.05*	3.34*	3.49*	3.62*
Control group for the agriculture sector								
Number of workers	1143	2227	2280	2280	2452	2323	2687	2860
Average education	7.91	8.16	8.29	8.37	8.31	8.45	8.6	8.63
Average age	34.48	33.99	24.8	34.39	34.69	34.02	34.167	34.07
Proportion African	0.76	0.75	0.75	0.78	0.79	0.79	0.77	0.81
Proportion male	0.68	0.69	0.68	0.67	0.7	0.71	0.69	0.7
Average hours worked last week	47.59	47.4	47.11	46.09	46.58	47.23	46.38	45.85
Real hourly wage (2000 Rands)	6.64	6.60	6.49	6.12	6.21	6.27	6.70	6.60
Retail Sector								
Number of retail workers	853	1460	1387	1388	1362	1514	1690	1622
Average education	9.66*	9.77*	9.83*	10.03*	10.24*	10.02*	10.23*	10.04*
Average age	33.51*	33.45*	33.1*	33.63*	33.28*	33.83*	32.76*	33.54*
Proportion African	0.62*	0.64*	0.64*	0.62*	0.65*	0.62*	0.61*	0.65*
Proportion male	0.51*	0.46*	0.46*	0.48*	0.46*	0.47*	0.48*	0.48*
Average hours worked last week	48.76*	49.31*	49.77*	48.61*	49.2*	49.75*	48.19*	48.06*
Real hourly wage (2000 Rands)	7.88	7.33*	6.57*	7.32	6.73	6.96	7.10	7.39
Control group for the retail sector								
Number of workers	2508	4345	3890	3604	3813	4346	4472	4535
Average education	8.15	8.23	8.46	8.57	8.42	8.46	8.61	8.81
Average age	36.01	35.56	36.03	35.67	35.64	35.16	35.17	34.96
Proportion African	0.72	0.72	0.71	0.72	0.73	0.73	0.72	0.73
Proportion male	0.68	0.66	0.66	0.66	0.68	0.69	0.68	0.67
Average hours worked last week	46.89	47.34	47.35	46.32	46.21	46.98	46.01	45.86
Real hourly wage (2000 Rands)	8.09	7.92	7.34	7.07	6.99	7.03	7.38	7.47

Source: South African Labour Force Survey from 2000 to 2007.

Notes: A t-test was performed to test the equality of means between the treated and control group. An asterisk indicates that the null hypothesis for the equality of means was rejected at the 5 percent level.

Table 2: Mean wage gaps for the agricultural and retail sectors

Agriculture sector	
Wage gap	0.47
Wage gap (<20 employees)	0.5
Wage gap(≥20 employees)	0.51
Wage gap(<50 employees)	0.45
Wage gap (≥50 employees)	0.4
Retail sector	
Wage gap	0.23
Wage gap (<5 employees)	0.33
Wage gap (≥5 employees)	0.22

Source: South African Labour Force Survey from 2000 to 2007.

4. Econometric results

4.1 Results for the agricultural sector

We now turn to difference-in-difference results. To see how small and larger farms respond differently to the introduction of minimum wages, the specifications, described in section 3.3, were split by farm employment size.[19] In particular, the analysis was split into four categories: farms with i) less than 20 employees, ii) less than 50 employees iii) more than 20 and iv) more than 50 employees. This section will first analyse the effect of minimum wages on employment, then the number of hours worked and lastly the wage results.

Table 3 shows the results from the impact of the introduction of minimum wages on employment in agriculture using the second specification, outlined in section 3.3. Two sets of results, each comprising of five regressions, are shown. The first set of results does not include controls, whereas the second set of results controls for race, education, gender and age as well as district council fixed effects, time dummies and agricultural real GDP. Each set of results is comprised of five regressions of which the first regression has no farm size restriction, followed by regressions in successive columns that restrict the sample to smaller and larger farms respectively. The dependent variable in table 3 is a binary variable, which takes on a one if the individual is employed as a farmworker and a zero if the individual falls within the control group as defined above. The sample therefore includes agricultural workers affected by the minimum wage, individuals who are looking for work or who are employed in elementary occupations in non-agricultural sectors, who could be affected by another minimum wage.

Column 1 of table 3, shows that the effect of the minimum wage is statistically insignificant. However, once one controls for fixed effects, seasonality, agricultural real GDP and other individual covariates in the first column of the second panel of results, the coefficient is negative and statistically significant. Employment reduced by about 1.1% in response to minimum wages.

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[19] The measure used for firm size is self-reported by the individual and not by the firm. This measure could therefore underreport the number of workers in a firm, particularly if the firm has more than one division or plant.

Table 3: Probability of employment in the agricultural sector

		1st set of results					2nd set of results			
	(I)	(II)	(III)	(IV)	(V)	(I)	(II)	(III)	(IV)	(V)
	no restrictions	<20	<50	>20	>50	no restrictions	<20	<50	>20	>50
Post	-0.009***	-0.071***	-0.081***	-0.081***	-0.076***	0.004	-0.012	-0.022	-0.025*	-0.015
Wage Gap	0.044***	0.142***	0.120***	0.023*	-0.003	2.018***	3.774***	3.144***	3.647***	1.160***
Wage Gap* Post	-0.005	-0.056***	-0.042**	0.016	0.040**	-0.011**	-0.077***	-0.083***	-0.01	0.032*
Individual controls	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
District controls	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Time dummies	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Agrigultural real GDP	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Constant	0.063***	0.190***	0.263***	0.242***	0.171***	0.077**	-0.540***	-0.307**	-0.089	0.219
Observations	182315	36023	45183	39484	29765	182253	36015	45170	39471	29757
R-squared	0.003	0.022	0.017	0.008	0.008	0.216	0.258	0.292	0.276	0.195

Source: South African Labour Force Survey from 2000 to 2007.

Notes: *** p<0.01; ** p<0.05; * p<0.1

Similar results apply to workers on farms with less than 20 and less than 50 employees respectively. The interaction coefficients are larger in columns 2 and 3 in both sets of results than for the unrestricted sample, indicating that most of job losses were concentrated on smaller farms. In particular, the results indicate that in response to a one percent increase in the initial wage gap, the probability of being a farmworker on a small farm decreased between 4.2% and 8.3% in the post-law period compared to the period before minimum wages were implemented. In contrast, the probability of employment on the very largest farms – those that employ more than 50 workers- *increased* by roughly 4% in response to the minimum wage.

Overall then, most of the disemployment effects caused by the introduction of minimum wages in the agricultural sector, occurred on small farms. Despite employment growth on large farms, they did not, however, absorb all workers who lost their jobs on small farms. The result is in an overall decrease in employment in the agricultural sector, as already documented by Bhorat *et. al.* (2014). However, the distinctions between small and large farms have not been highlighted before, and provide a nuanced view of the mechanisms by which minimum wages operate in agriculture.

A number of potential explanations exist for why small and large farms responded differently to the introduction of minimum wages. Firstly, larger farms, overall, pay higher wages than small firms as was shown in Table 2: larger farms had a smaller gap to reach minimum wage levels compared to smaller farms. Furthermore, large firms usually have a more capital-intensive production process, a viable option mainly for larger farms who can exploit economies of scale;

therefore costs in larger farms rise by a smaller proportion than in smaller farms when minimum wages are introduced. Both of these indicate that minimum wages could place a bigger burden on small farms compared to bigger farms. This burden could drive small farms out of the market, where the disemployment effects do not only suggest that the number of workers employed decreased, but that some small farms had to shut down. This finding is in line with Rankin (2016) who showed that small firms in a tradable sector (manufacturing), which are exposed to external competition, are more sensitive to increasing wages and often need to exit the market as a result.

The result is that there is an increase in the concentration of employment on larger farms. This raises intra-sectoral inequality of production and intensifies an existing problem. Structural change in the agricultural sector has led to major job destruction over the long-run. In the last three decades alone, agricultural employment has decreased by roughly one million (Liebenberg & Kirsten, 2013). Moreover, the number of farms decreased, while farm sizes and the number of employees per farm increased. Increasing concentration in the sector arose, as smaller players exited; they could not compete with larger farms who could more easily take advantage of more productive, capital-intensive production processes. Indeed, Garbers (2014) has shown that this overall pattern intensified after the imposition of minimum wages: farms have become more capital-intensive and have focused their hiring on better skilled workers. Unskilled jobs suffered. Moreover, between 2008 and 2011, the number of farmers in South Africa decreased from 50 332 to 34 905 (Liebenberg & Kirsten, 2013; Liebenberg & Pardy, 2012). It has also been noted that there are relatively few new entrants in agriculture. Therefore, when some farmers exit the market, the remaining farms increase in size (Simbi & Aliber, 2000). Additionally, these larger farmers have better access to international markets and achieve better export penetration. By contrast, smaller farmers are not resilient to the imposition of minimum wages, due to their low levels of access to international markets.

The next sub-section considers whether employers in agriculture responded to the legislation by reducing the number of hours worked. Results are reported in table 4. To analyse the response in the number of hours worked, both specifications described in section 3.3 were used. Table 4 reports three sets of results, each comprising of five regressions. The first set of results uses specification (1), which aims to see how the number of hours worked in the agricultural sector responded to the legislation relative to a control group (which was chosen to have similar characteristics as

farmworkers). The second and third sets of results are based on specification (2), and is restricted to only farmworkers.

Table 4: Number of hours worked in the agricultural sector

	1st set of results					2nd set of results					3rd set of results				
	(I)	(II)	(III)	(IV)	(V)	(I)	(II)	(III)	(IV)	(V)	(I)	(II)	(III)	(IV)	(V)
	no restrictions	<20	<50	>20	>50	no restrictions	<20	<50	>20	>50	no restrictions	<20	<50	>20	>50
Post	-2.611***	-2.237***	-2.482***	-2.769***	-2.524***	-1.463***	-2.451***	-1.702***	-0.278	-0.999*	-4.718***	-4.544***	-4.977***	-5.084***	-3.845***
Sector	3.609***	4.410***	4.028***	2.855***	2.379***										
Sector*Post	-1.873***	-2.278***	-2.080***	-1.336***	-1.104**										
Wage Gap						8.154***	6.730***	8.637***	8.237***	7.256***	0.674	-14.269	-12.008	28.502*	25.925*
Wage Gap* Post						-2.232***	-0.917	-2.030**	-4.508***	-2.746	-1.861**	-1.143	-1.910**	-2.926**	-1.317
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District controls	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Constant	48.304***	47.567***	48.032***	49.282***	48.682***	48.624***	50.041***	48.502***	48.494***	48.535***	50.194***	52.570***	52.223***	47.054***	44.452***
Observations	40434	24314	31500	27871	20685	21948	10083	16235	11441	5449	21948	10083	16235	11441	5449
R-squared	0.066	0.073	0.072	0.06	0.057	0.039	0.032	0.042	0.039	0.037	0.059	0.067	0.069	0.073	0.082

Source: South African Labour Force Survey from 2000 to 2007.

Notes: *** $p<0.01$; ** $p<0.05$; * $p<0.1$

The negative and statistically significant interaction coefficient suggests that the number of hours worked decreased by approximately two hours per week in the post-law period relative to the control group. Looking at the first set of results by firm size, sketches a similar story, in which smaller firms reduced the hours by more than bigger firms. The second and third set of results, presented in table 4 use the second specification and are run only on a sample of farmworkers. Results are similar to the first approach, with farms reducing the number of hours worked by approximately two hours per week (for every 1% that the wage gap was narrowed) after minimum wages were introduced relative to the pre-law period. Only the largest farmers did not adjust hours downwards. Overall, the results suggest that mainly smaller employers adjusted on the intensive margin.

The third outcome variable that is analyzed, is the log of real hourly wages. Table 5 presents the results for the agricultural sector and follows the same setup as the table above. The positive and statistically significant coefficient on the interaction term suggests that farmworker wages increased by 26.2% in the post-law period relative to the control group. This trend also holds for regressions restricted by firm size in the first set of results. The coefficient on the interaction term for the smaller farms is larger, indicating that wages grew faster on small farms than for bigger farms. However, when analysing the interaction coefficient in the second and third sets of results, it suggests that smaller farms' wages grew slower than those on larger farms. Since there might be

spillover effects when using the first specification as discussed previously, the second specification is the preferred result.

Table 5: Log of real hourly wages in the agricultural sector

	1st set of results					2nd set of results					3rd set of results				
	(I)	(II)	(III)	(IV)	(V)	(I)	(II)	(III)	(IV)	(V)	(I)	(II)	(III)	(IV)	(V)
	no restrictions	<20	<50	>20	>50	no restrictions	<20	<50	>20	>50	no restrictions	<20	<50	>20	>50
Post	0.115***	0.129***	0.125***	0.103***	0.098***	0.169***	0.204***	0.169***	0.112***	0.138***	0.330***	0.410***	0.337***	0.264***	0.282***
Sector	-0.665***	-0.635***	-0.640***	-0.619***	-0.576***										
Sector*Post	0.262***	0.283***	0.270***	0.221***	0.217***										
Wage Gap						-0.840***	-0.696***	-0.827***	-0.876***	-0.805***	-0.437	-0.683	-0.213	-1.514*	-0.902
Wage Gap* Post						0.365***	0.311***	0.359***	0.506***	0.458***	0.337***	0.274***	0.322***	0.413***	0.407***
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District controls	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Constant	1.026***	1.001***	1.033***	0.955***	0.900***	0.702***	0.598***	0.703***	0.687***	0.689***	0.803***	0.895***	0.779***	0.978***	0.926***
Observations	40176	24172	31303	27671	20540	21806	10036	16140	11349	5405	21806	10036	16140	11349	5405
R-squared	0.449	0.401	0.429	0.404	0.354	0.294	0.26	0.289	0.305	0.299	0.336	0.322	0.332	0.365	0.38

Source: South African Labour Force Survey from 2000 to 2007.

Notes: *** p<0.01; ** p<0.05; * p<0.1

These results have clearly shown that wages have increased substantially as a result of the introduction of minimum wages in the agricultural sector and that wages have grown faster on larger farms. This once again points toward the fact that bigger farms appear to be more profitable since they were able to increase wages and employment simultaneously.

In the following section, results for the retail sector are presented. We seek to find out whether small firms in a sector, not reliant on exports, also experienced disemployment effects as a result of the introduction of minimum wages.

4.2 Results for the retail sector

Within the retail sector, the minimum wage varies according to a number of other legislated classifications. A prominent condition is firm size, which was in place until the end of 2005; firms that employ less than 5 workers had a lower legislated minimum wage which was roughly 70% of the minimum wage payable by firms who employed 5 or more workers. While this concession should reduce differences across firm size categories, our analysis in Table 2 highlights that the smallest firms nevertheless had larger wage gaps to narrow to comply with minimum wage legislation.

Table 6 shows the impact of the introduction of minimum wages on the probability of employment in the retail sector. As with agricultural employment, table 6 includes two sets of results. The first includes no controls, whereas the second includes a full set of controls. Both sets of results are based on specification (2), as outlined in section 3.3. Each set of results is in turn comprised of three regressions, one with no firm size restriction, one restricted to firms that employ less than 5 people and one for the sample of firms that has five or more employees[20].

Table 6: Probability of employment in the retail sector

	1st set of results			2nd set of results		
	(I)	(II)	(III)	(I)	(II)	(III)
	no restrictions	<5	≥5	no restrictions	<5	≥5
Post	0.006***	0.000	0.010**	0.011***	-0.021**	0.000
Wage Gap	-0.012***	0.013**	-0.061***	-0.194***	-0.032	-0.088*
Wage Gap* Post	0.000	-0.003	0.002	-0.004	-0.008	-0.016
Individual controls	No	No	No	Yes	Yes	Yes
District controls	No	No	No	Yes	Yes	Yes
Time dummies	No	No	No	Yes	Yes	Yes
Constant	0.044***	0.051***	0.126***	0.058***	0.214***	0.066***
Observations	274983	48591	78786	274832	48568	78736
R-squared	0.000	0.000	0.002	0.031	0.061	0.067

Source: South African Labour Force Survey from 2000 to 2007.

Notes: *** p<0.01; ** p<0.05; * p<0.1

Regardless of specification or firm size restriction, minimum wages have no impact on employment in the retail sector. Small firm employment - despite having the largest pre-legislation wage gaps – is therefore immune to the imposition of minimum wages. This stands in stark contrast to the agricultural sector, where small farms experienced large employment losses while large farm jobs grew. We posit that retail's focus on the local (as opposed to the export) market makes small firms less vulnerable to wage pressures.

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[20] Different firm size categories were used for the retail sector, as minimum wages varied by firm size in this sector: minimum wages for firms less than 5 employees were roughly 70% of the minimum wage for retail firms which employed 5 of more workers. In future, additional regressions should be run on the same firm size categories as in agriculture to make the results more comparable.

Table 7 shows the results for the number of hours worked in the retail sector and has the same setup as table 4 which showed the number of hours worked results for the agricultural sector. Again, instead of splitting the analysis into four different firm size categories, this analysis is split only between firms with less than five employees and five or more employees. No statistically significant hours adjustments occurred in any segment of the retail sector.

Table 7: The number of hours worked in the retail sector

	1st set of results			2nd set of results			3rd set of results		
	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
	no restrictions	<5	≥5	no restrictions	<5	≥5	no restrictions	<5	≥5
Post	-2.331***	-5.194***	-1.709***	-0.576	-1.829	-0.37	-2.406***	-5.944**	-1.058
Sector	2.667***	8.501***	0.734**						
Sector*Post	-0.208	-0.39	0.303						
Wage Gap				8.137***	4.006**	6.295***	0.245	-6.884	0.496
Wage Gap* Post				-1.591	-0.604	0.591	-1.993	-1.349	0.323
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Constant	47.102***	48.896***	47.203***	54.351***	62.905***	50.636***	51.666***	63.770***	47.692***
Observations	42763	9136	32789	11203	2599	8111	11203	2599	8111
R-squared	0.048	0.11	0.046	0.065	0.101	0.046	0.096	0.156	0.076

Source: South African Labour Force Survey from 2000 to 2007.

Notes: *** p<0.01; ** p<0.05; * p<0.1

Lastly, table 8, which follows the same setup as table 5, shows the impact of the introduction of minimum wages on average real wages in the retail sector. When restricted to small firms, only the exhaustive specification in panel 3 indicates that wages increased significantly as a result of the minimum wage. In contrast, all regressions indicate that larger firms increased their wages. Even in retail, larger firms have marginally better capacity to raise wages without cutting employment. While wage non-compliance may have risen in small retail firms, their ability to pass on the cost of wage increases to consumers is higher than in agriculture. This finding reflects small retail firms' relatively low reliance on export markets.

Table 8: Log of real hourly wages in the retail sector

	1st set of results			2nd set of results			3rd set of results		
	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
	no restrictions	<5	≥5	no restrictions	<5	≥5	no restrictions	<5	≥5
Post	0.222***	0.342***	0.197***	0.063***	0.074	0.054**	0.270***	0.270**	0.219***
Sector	-0.172***	-0.298***	-0.106***						
Sector*Post	0.048**	-0.009	0.045**						
Wage Gap				-0.890***	-0.547***	-0.797***	-1.120**	0.292	-0.537***
Wage Gap* Post				0.231***	0.106	0.195*	0.205***	0.147*	0.169*
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Constant	0.855***	0.704***	0.929***	0.232***	-0.073	0.533***	0.378***	-0.089	0.650***
Observations	42491	9063	32598	11147	2592	8065	11147	2592	8065
R-squared	0.347	0.344	0.336	0.343	0.407	0.3	0.417	0.5	0.366

Source: South African Labour Force Survey from 2000 to 2007.

Notes: *** $p<0.01$; ** $p<0.05$; * $p<0.1$

5. Conclusion

The relationship between minimum wages and employment outcomes has been debated for many years. Until today, there is no consensus among economists on the nature of this relationship. Substantial heterogeneity exists in the effects of minimum wages. While the South African literature analyses many different sectors, an important intra-industry distinction is the vulnerability of small firms to minimum wages, especially in tradable sectors. Previous results show that, overall, non-tradable sectors experienced no disemployment effects; however agriculture, a tradable export sector, experienced large disemployment effects. This paper emphasizes that most of the disemployment effects were concentrated on small farms that do not have the ability to invest in capital, better skilled workers and to penetrate export markets. Large farms, in contrast, experienced employment growth as a result of the introduction of minimum

wages. However, since larger farms employ more skilled workers and have a more capital-intensive production process, the least skilled, who are supposed to benefit from minimum wages, are losing out. Overall, the increasing concentration of farming among larger players over time was intensified by the introduction of agricultural minimum wages. Minimum wages therefore contribute to intra-industry inequality among farmers. These results should largely be read in the historical context of South Africa's agricultural sector, where success is determined by being a large player that is able to export. These conclusions differ from previous results, in that they take into account intra-industry dynamics; in particular we show the debilitating effect of minimum wages for small farmers.

By contrast, these distinctions are not apparent in the retail sector. Small and large firms were equally immune to job loss. What sets this sector apart from agriculture is that retail sales are not sensitive to external pressures. Small and large operators compete internally, and not on the international market, enabling retail firms to increase prices and thereby shifting the burden of increasing labour costs onto the consumer.

Our results therefore show that the imposition of a national minimum wage will likely have heterogeneous effects. While it is possible that overall the impact could be negligible, this finding ignores the definite role it could have in reducing small firm employment in tradable sectors. The implication would be lower levels of competition in export-orientated industries. While the National Development Plan targets small firms for job growth (Republic of South Africa, 2013), the national minimum wage makes limited provision for their vulnerability in specific sectors (Republic of South Africa, 2016). A uniform approach to minimum wage design could therefore raise intra-industry inequality in tradable sectors, despite potentially having an equalizing cross-economy effect.

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