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Assessing the Effects of Two Agricultural Minimum Wage Shocks in South Africa

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Abstract

In March of 2003, South Africa's first agricultural minimum wage was implemented. Ten years later, following major strikes and protests among farm workers in the Western Cape, the prescribed agricultural minimum wage was increased by a considerable 52 percent from R69 per day to R105 per day, significantly more than the usual inflation rate increases. This paper investigates the impacts of these two minimum wage shocks, specifically assessing the labour market response in terms of employment, wages and working conditions, as well as assessing how farmers adjusted their operations in expectation of the minimum wage hike. The findings indicate that the probability of employment as a farm worker decreased in response to both minimum wage shocks, however the disemployment effect was sharper for the introduction of the minimum wage than it was for the 2013 amendment. It is observed that relatively more part-time workers lost their jobs in response to the first shock, resulting in there being almost no part-time workers in the sector by the time the second minimum wage shock occurred. Wages increased significantly in response to both minimum wage shocks, however despite this, violation consistently remained a challenge in the sector. Lastly, the paper finds that employment, wages and contract coverage began adjusting up to two quarters prior to the 2013 legislated increase in the minimum wage, suggesting that there are dynamic responses to minimum wages, and that farmers may make operational decisions in expectation of new legislation.

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Chapter 1

Introduction

In South Africa, minimum wages are enforced in sectors where workers are particularly vulnerable to exploitation and where there are low levels of unionisation, hence where worker protection and representation is limited. Minimum wages attempt to regulate the labour conditions in these environments by setting a legal wage floor and by stipulating various minimum conditions of employment, with the clear intention of bringing wages up to at least some reasonable predetermined "Living Wage", and improving working conditions. The theoretical predictions and empirical evidence in the area of minimum wages tell conflicting stories about the effects of minimum wage laws on labour market indicators, where job losses and increased wages are possible outcomes. In South Africa, a country with a stubbornly high unemployment rate of approximately 26.5 percent (Statistics South Africa, 2017b:9), high rates of poverty, working poverty and inequality (Statistics South Africa, 2014), as well as lively discussions about the viability of a national minimum wage, it is essential that we understand the implications of policies like these.

Sectoral Determination 13[1], originally legislated in March of 2003 and revised on a three-yearly basis, outlines South Africa's agricultural minimum wage (Department of Labour, 2006). The Sectoral Determination originally required farmers to pay workers at least R650 or R800 per month, depending on whether the farm was located in rural or urban areas. According to Bhorat, Kanbur and Stanwix (2014:1403), at the time when this Sectoral Determination was introduced more than 80 percent of urban farm workers and 60 percent of rural farm workers earned less than their new respective minimum wage, thus the law required a drastic transformation of wages and could therefore have resulted in a restructuring of employment in the sector. It is therefore possible that agricultural employment declined in response to this initial minimum wage shock as farmers adjusted their operations to allow for the increased wages and improved working conditions that the law required.

According to Sectoral Determination 13, the farm worker minimum wage is legally prescribed to increase on an annual basis at approximately 1.5 percent above the Consumer Price Index (CPI). Even with these adjustments to the minimum wage, by late 2012 the minimum wage level was insufficient to meet the

[1]The farm worker's Sectoral Determination was originally called Sectoral Determination 8, however it was changed to Sectoral Determination 13 in 2006. For the remainder of the paper we will refer to the farm workers minimum wage as Sectoral Determination 13 for simplicity.

expectations and requirements of many farm workers, where according to Andrews (2014:1) the average farm worker earned between R60 and R80 a day in 2012. Consequently, in March of 2013, after a series of violent protests and strikes across the Western Cape, a 52 percent increase to the farm worker's minimum wage was brought into effect. In nominal terms the minimum wage increased from R1503.90 per month to R2273.52 per month. This increase was far larger than any minimum wage increase that the industry had encountered before that point. Like the initial introduction of the minimum wage, this second shock to the industry required farmers who were paying at or below the minimum wage to adjust wages significantly in order to comply with the law. This would likely have resulted in employment restructuring with the possibility of employment losses either at the extensive or intensive margin, or both[2].

Figure 1.1: Agricultural Employment and the Real Minimum Wage, 2001-2014

Source: Bhorat et al. (2014:1408) for 2001-2007; Labour Market Dynamics in South Africa for 2008-2014, own calculations (weighted using sampling weights); Sectoral Determination 13 for minimum wage levels, own calculations (real values, reflected in 2013 constant prices). The dashed lines indicate the periods in which the two minimum wage shocks occurred, namely 2003 and 2013.

To illustrate these two shocks and adjustments over time, Figure 1.1 presents the employment level amongst low-skilled agricultural workers[3] as well as the real minimum wage level between 2001-2014. The figure illustrates a steady increase in the real minimum wage between 2003 and 2012, although in some cases it deteriorated, particularly in 2008 and 2011. We also observe the significant increase in the real minimum wage at the time of the 2013 Sectoral Determination review. In terms of employment, we observe notable declines in the number of farm workers employed after both the 2003 and the 2013 minimum wage shocks.

[2]An adjustment at the extensive margin would involve the firm changing the total number of employees it demands, while an adjustment at the intensive margin would involve a firm changing the hours of work that it demands from its employees.

[3]Figure 1.1 illustrates employment amongst only elementary farm workers according to their Standard Industrial Classification (SIC) and South African Standard Classification of Occupations (SASCO) codes, as this is the sample of workers that are impacted by the minimum wage and who are therefore assessed for the remainder of this paper.

Although we observe declines in employment following both of the shocks, there is also an overall observable and drastic decline in employment in the sector over the whole period, which could have had other contributing factors besides the minimum wage. Other factors that may have caused a decline in employment over the period include the adoption of production technologies that serve as a substitute for farm labour, or decreased production levels due to environmental factors such as droughts. Although it is clear from the figure that employment declines did occur prior to the promulgation of the minimum wage (suggesting an employment transformation in the industry irrespective of the minimum wage), expectations of employment changes as a result of the minimum wage shocks should not be dismissed, calling for further investigation into the impact of the minimum wages on employment. Therefore, this paper will analyse these decreases in employment and empirically test the role of the minimum wage shocks in this trend of decreasing employment.

In order to critically assess the labour market impacts of the minimum wage shocks the paper will recall the findings of Bhorat, Kanbur and Stanwix (2014), who empirically evaluate the impact of the initial minimum wage on employment, hours worked, wages and contract coverage. We will then present an empirical analysis of the 2013 minimum wage hike, following a methodological approach similar to that of Bhorat et al. (2014), for comparability. In doing this, the paper will present an overview of the labour market responses to these two major minimum wage shocks, and then compare these responses. The investigation will focus on how employment adjusted in response to the minimum wages (at both the intensive and extensive margins), and whether wages and contract coverage were affected by the Sectoral Determination.

The rest of the paper will be structured as follows; in Section 2 we will discuss the context of the research, focusing on the history of agriculture in South Africa, as well as how minimum wages have evolved in the country. Section 2 will then also discuss the empirical findings of other literature in the area of minimum wages, particularly for low-skilled and rural occupations, as well as in the developing country context. We will also outline the main findings of previous research regarding the introduction of the farm worker's minimum wage, providing a platform for a comparison between the impacts of the first and second minimum wage shocks later in the paper. In Section 3 we will then discuss the theoretical predictions of the impact of minimum wages in terms of the adjustments of the various labour market indicators. We then develop our analysis of the second minimum wage shock, where Section 4.1 describes the data and econometric methodology that will be used, while Sections 4.2 and 4.3 present the descriptive and econometric findings. Section 5 then discusses and compares the labour market responses of the two shocks, describing how the labour market adjusted to each of these. Lastly, Section 6 will conclude the paper.

Chapter 2

Background and Literature Review

This section will describe the background of South Africa's farming sector, particularly in terms of deregulation and labour legislation, and presents the history and evolution of minimum wages in South Africa. Thereafter it presents the findings of other minimum wage studies, specifically focusing on minimum wage literature from other rural, low-skilled and disorganised labour market contexts, as well as literature from other developing countries. We place particular emphasis on the employment and wage findings as these are most relevant to our study.

2.1 A History of Agriculture in South Africa

To better understand the current state of the agricultural labour market it is helpful to present the background and context of the industry, particularly in terms of legislation. Sandrey et al. (2011) and Visser and Ferrer (2015) both summarise the process of regulatory reform in South Africa's agricultural sector. According to Visser and Ferrer (2015), even before 1948 there existed significant state support for white commercial farms, for example in the form of the Land Act of 1913 and the Natives Trust and Land Act of 1936, under which only 7 to 14 percent of farm land was allocated to the African population. Other legislation and institutions created by the government supported and protected the agricultural industry, particularly white farmers who owned the vast majority of the productive and fertile agricultural land. The Land Bank of South Africa and the Agricultural Credit Board both made provision for credit and financial services for farmers within the industry, particularly for white farmers. A network of primary producer cooperatives, established under the Cooperative Society Act, negotiated relatively cheap inputs and services, such as storage and transport, for the industry. Finally, Control Boards regulated the movement, price setting, monitoring, quality standards and trade of agricultural products, given the statutory powers conferred on them by the Marketing Act. These boards also played a major role in the export of all agricultural produce, particularly by maintaining high export prices (Visser and Ferrer, 2015). Thus, by the 1970's the commercial farming sector had high levels of state support and protection, and was highly racially segregated, with white farm owners benefiting most within the industry (Sandrey et al., 2011:5).

This began to change in the early 1980's with a major shift towards industry deregulation as the state began to withdraw from the sector. This process then quickened with the 1994 elections when state support of white farmers became politically unappealing. A significant reduction of South Africa's protectionist tariffs followed the 1994 Uruguay Round of Negotiations of the World Trade Organisation—tariffs dropped well below that which was required by the Uruguay Round Agreement. Furthermore, many agricultural subsidies were dropped when the General Export Incentive Scheme was scrapped by the government in 1997 (Visser and Ferrer, 2015). This reduction of state support in the agricultural industry resulted in a decline of South Africa's Producer Support Estimate (representing policy transfers to agricultural producers) to a meagre 3 percent, significantly below the 20 percent average for the Organisation of Economic Cooperation and Development member countries (Visser and Ferrer, 2015).

While the government withdrew a large amount of its protection of the farming industry from the 1980's, it also began to intervene in the sector in new ways in the 1990's. Previously, the agricultural sector had had very little labour regulation governing it. This began to change when in 1993, the Basic Conditions of Employment Act of 1983 and the Unemployment Insurance Fund were extended to cover farm workers. However, even with this initial adjustment farm workers were still treated as a unique case in all labour regulation (Visser and Ferrer, 2015). This changed with the establishment of the Basic Conditions of Employment Act 75 of 1997 (BCEA), when agricultural workers were included for the first time in general labour legislation, and were thus on par with other South African workers (Visser and Ferrer, 2015). Besides farm workers being included in the BCEA, the Labour Relations Act of 1995 (LRA) also extended bargaining rights to farm workers. However, very few farm workers were organised; approximately 6 percent of workers according to Visser and Ferrer (2015), leaving the remaining 94 percent of workers with very little power to bargain for better wages and working conditions, despite the fact that the LRA made provision for this. This lack of labour organisation, combined with South Africa's history of disadvantaging African farm workers, resulted in working conditions that were (and often still are) generally very poor, with farm workers earning the lowest wages amongst formally employed workers, as well as enduring high levels of poverty and low levels of food security (Ledger, 2016:29). Because of this lack of worker organisation and high degree of worker vulnerability in the industry, in 2003 Sectoral Determination 8 was established, outlining a minimum wage and minimum conditions of employment for farm workers. The agricultural minimum wage is the focal point of this paper and will therefore be expanded upon in detail in the following section. Besides labour legislation, the state also intervened in the industry in the form of a land reform process and through the Extension of Security and Tenure Act 62 of 1997, both of which intended to facilitate the reallocation of land back to the African population and workers who live on farms, and to prevent the eviction of farm workers without farmers following due legal process (Visser and Ferrer (2015); and Ledger (2016:29)).

Thus, overall the agricultural industry has undergone massive policy transformation in recent years, with both the withdrawal of most state-support and protection from the industry, as well as increased labour regulation and protection. The agricultural labour market adjusted significantly over this period. As we have already observed from Figure 1.1, agricultural employment declined significantly in recent years, however employment declines in the industry are also noted further back by Altman (2006), who estimates that approximately 1.2 million agricultural jobs were lost between 1970 and 1995. These declines in agricultural

employment mimic the trends of other medium and high-income countries that are shifting towards agricultural mechanisation in response to changing relative factor costs. However, Simbi and Aliber (2000) suggest that the similarity in this trend is only superficial, and that a major motive for agricultural labour substitution may have to do with farmers' perceptions of the changing agricultural labour environment. Both Simbi and Aliber (2000) and Newman, Ortmann and Lyne (1997) investigate farmers' perceptions surrounding labour legislation, both finding that in many cases the decision to shed permanent agricultural workers was related to the fear of losing land to resident farm workers (Simbi and Aliber, 2000), and because workers are more difficult and costly to manage with the increased labour legislation (Newman, Ortmann and Lyne, 1997). This suggests that in the context of significant policy transformation in the farming industry, farmers regard labour legislation with some apprehension and frustration, and that tightening labour laws such as the minimum wage could result in employment losses for more diverse reasons than simply the changing relative cost of labour. Thus, such adjustments should be carefully considered and investigated.

2.2 Minimum Wages in South Africa

Because of the high number of vulnerable workers in South Africa it is important that workers are adequately protected and represented, and that labour markets are in some way regulated to avoid exploitation. To achieve this the country's labour law was one of the first areas to be reformed after its democratisation in 1994. Four key pieces of legislation were put in place that aided the strengthening of worker rights: the South African Constitution which lays out the rights of workers under Section 23; the Labour Relations Act of 1995 which promotes economic development, social justice, labour peace and democracy in the workplace (Department of Labour, 2015); the Basic Conditions of Employment Act 75 of 1997 which regulates employment conditions such as leave, termination and employment contracts; as well as the Extension of Security of Tenure Act 62 of 1997 which sets out the procedures and limitations of eviction of workers occupying land (Bhorat et al., 2014:1402).

In South Africa, wage formation works through two major avenues, besides private wage negotiation. Firstly, wages can be determined through collective bargaining done by bargaining councils which consist of one or more registered trade union/s, and one or more registered employer organisation/s, representing a specific sector and area. Bargaining Councils have the power to enact and enforce collective agreements (written agreements regarding workers' terms and conditions of employment, including wages), amongst other things. Secondly, in cases where workers are especially vulnerable and where collective bargaining councils do not have the capacity to protect workers due to a disorganised workforce, governments can intervene by setting a legal minimum wage (and often other conditions of employment, such as hours of work or contract requirements) at the sectoral level. Minimum wages are governed by the Employment Conditions Commission (ECC) and have the explicit intention of ensuring that workers in low-paid, vulnerable occupations are guaranteed a basic subsistence income and are in some way protected in the working environment. Minimum wages in South Africa are unique when compared to many other countries as there is not a single national minimum wage, but rather the minimum wage can differ across sectors and these sectoral minimum wages can then vary further according to occupation types and across geographical areas. South Africa's first

nationally binding minimum wage was implemented in 1999 and applied to workers in the contract cleaning sector. Since then minimum wages have been introduced in eleven sectors covering contract cleaning, civil engineering, learnerships, private security, domestic work, wholesale and retail, the work of children in the performance of advertising, artistic and cultural activities, the taxi industry, forestry, agriculture, and hospitality.

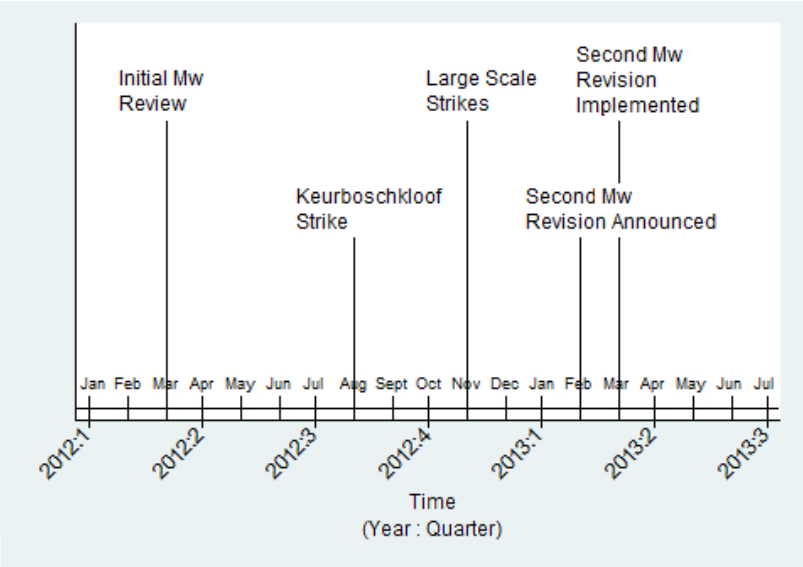
Minimum wages were introduced in the agricultural sector for the first time in 2003 in the form of Sectoral Determination 8 (which became Sectoral Determination 13 in 2006). The Sectoral Determination outlined minimum wages for workers which initially varied according to the area of employment, where minimum wages for Area A were set at R800 per month, and minimum wages for Area B were set at R650 per month[4]. This distinction between Areas A and B was not rigidly applied. For example, farmers were able to apply for exemption from paying Area A wages and were then allowed to pay the lower Area B wages, despite their location (Murray and Van Walbeek, 2007:15). The distinction between Areas A and B was abolished with the 2006 revision of the Sectoral Determination, when a nationally binding minimum wage was applied to the sector. Besides the minimum wage, Sectoral Determination 13 outlines various basic conditions of employment for farm workers including contract requirements, usual hours of work, overtime hours and overtime pay, amongst other things. The minimum wage is revised every three years and this set amount is then increased annually at a rate prescribed within the Sectoral Determination, which is generally centred around Statistics South Africa's estimated Consumer Price Index (usually CPI plus 1.5 percent) (Ledger, 2016:xvi). In early 2012 the minimum wage was revised and set for the period from the 1^{st} of March 2012 until the 28^{th} of February 2014, at R69 per day for the 2012 year with prescribed yearly increases of CPI plus 1.5 percent (Ledger, 2016:xvi). The minimum wage was only scheduled to be reviewed again in early 2015. By November of 2012 however, massive strikes and protests in the industry indicated that this minimum wage level was insufficient and that more needed to be done to ensure reasonable wages and working conditions for farm workers.

According to Kardas-Nelson (2013), workers in the farming industry suffer under poor living and working conditions, despite the minimum wage. Food insecurity is a major challenge amongst farming communities—especially among women who generally earn less than men on farms—which results in high levels of growth stunting amongst farmers and their families. Resultantly, farm workers are approximately 2.5cm shorter than city dwellers (Kardas-Nelson, 2013). Food insecurity also results in farm worker's children regularly going hungry and thus becoming more susceptible to illness as well as having a weakened ability to concentrate at school. Furthermore, farm workers often have inadequate housing and poor access to services, and as a result of these, tuberculosis is a major challenge for many farming communities. High levels of violence and alcohol abuse are also prevalent in farming communities, and inadequate protective clothing and gear also often result in pesticide exposure for farm workers (Kardas-Nelson, 2013). These conditions, combined with the significant distances that farming families often have to travel to reach the nearest clinics and schools, result in poor health and education outcomes for farming communities. Combined, these pressures and stresses amongst farm workers culminated in 2012, when farm workers in the Western Cape began striking for higher minimum wages and better working conditions.

[4]Area A was classified as "urban", while Area B was classified as "rural".

Ledger (2016) describes the circumstances surrounding the strikes that lead to the significant increase in the minimum wage. According to Ledger (2016:xi) the farm worker strikes began on the 27^{th} of August 2012 on the Keurboschkloof wine farm, in De Doorns of the Hex River Valley in the Western Cape, involving mostly women. The Keurboschkloof staff were aggrieved because of a change in management that resulted in salary reductions of up to 30 percent, as well as many workers' contracts being changed from permanent to seasonal work, resulting in reduced job security. Once the strikes at Keurboschkloof began, other workers in the fruit and grape industry sympathised with the cause and soon joined the protests. Soon the strikes spread to 16 towns including Clanwilliam, Robertson, Grabouw and Swellendam, all in the Western Cape, involving thousands of farm workers (Ledger, 2016:xvi) (History of Labour Movements in South Africa, 2015). By November 2012, the strikes had escalated significantly, resulting in numerous clashes between police and strikers, the burning of vineyards and orchards, farmers' cars being torched, and attacks on journalists. During the protests, three strikers were killed and many more were injured and arrested during confrontations with police (History of Labour Movements in South Africa, 2015). The primary demand was for an increase in the minimum wage from R69 per day to R150 per day, as well as for various improvements to the minimum conditions of employment, including payment on rainy days (which generally prevents farm labourers from working), women demanding equal pay to men, paid annual leave and paid maternity leave (History of Labour Movements in South Africa, 2015). Initially, government attempted to encourage the parties to resolve the strike through direct negotiations, however these attempts failed. Thus, on the 15^{th} of November, 2012, the Department of Labour released government gazettes indicating that the 2012 revision of Sectoral Determination 13 would be cancelled, as well as announcing their intention to begin a process of reviewing minimum wages in the sector (Ledger, 2016:xvii) (History of Labour Movements in South Africa, 2015). Negotiations took place on November 22^{nd} under the supervision of the Commission of Conciliation, Mediation and Arbitration, and involved AgriSA, African Farmers Association of Africa, Agri-Sector Unity Form, Landbou Werkgewesorgorgnisasie, Farm Workers/Dwellers Forum, Agricultural Workers Empowerment Union Council, Food Sovereignty Campaign, Women on Farms Project, Mawubuye Land Rights Forum, Food and Allied Workers Union, Congress of South African Trade Unions, Cape Agriculture Employers Organization, and Transvaal Agricultural Union of South Africa (History of Labour Movements in South Africa, 2015). However, this negotiation platform did not lead to consensus and the strikes resumed over the December to January period. By the end of January, after three months of work stoppages and campaigns on the Western Cape's fruit and grape farms, most of the protest action had died down, and the strikes officially came to an end. On the 4^{th} of February 2013, the new minimum wage of R105 per day was announced by the Minister of Labour, a 52 percent increase from the previous minimum wage.

Figure 2.1: Timeline of the Agricultural Minimum Wage Adjustment



Source: Own calculations.

Figure 2.1 presents a summary of the above mentioned events in a timeline format. From the timeline it is clear that there was significant unrest in the sector leading up to the adjustment of the minimum wage. For this reason, it is likely that farmers would have expected an above average increase in the minimum wage. This lays the foundation for the expectations model that is presented in the econometric analysis later, as it is possible that farmers began adjusting operations, including employment and wage levels, in anticipation of the minimum wage increase.

2.3 An Assessment of Other Empirical Findings

In the following sub-sections we will assess the existing literature in the area of minimum wage impacts in order to inform our study. There exists a wealth of international literature examining the effects of minimum wage policies, however, in the current context we are particularly interested in findings concerning similar industries and environments to the one in which the South African farm worker minimum wage shocks occurred. For this reason we will focus on the literature discussing the initial agricultural minimum wage in South Africa, other agricultural minimum wage studies, minimum wages in other low-skill occupations, and the literature from other developing countries, specifically Sub-Saharan Africa and Latin America.

2.3.1 Minimum Wages for Farm Workers and Other Low-skilled Occupations

Prior to the implementation of the farm workers' minimum wage, Newman, Ortmann and Lyne (1997) study farmers' perceptions about the intensifying labour legislation in the farming industry, which at that time was primarily the inclusion of farm workers in the broader South African labour legislation such as the BCEA

and the LRA. The study finds that farmers perceived labour legislation to be costly and time consuming and that they would prefer legislation that is more flexible (Newman, Ortmann and Lyne, 1997:8). The survey respondents indicated that they believed that if a minimum wage set above market wages was introduced in the sector, some labour would be replaced by machinery and contract workers (Newman, Ortmann and Lyne, 1997:9). The paper also finds that farmers would have preferred minimum wages to have taken into account enterprise and regional differences, and to have been determined by an industrial council (Newman, Ortmann and Lyne, 1997:10).

As we know from Section 2.2, minimum wages extended to the agricultural sector in March of 2003. Amongst a number of other studies, Bhorat et al. (2014) assess the impact of this first agricultural minimum wage. Later in this paper, we employ similar techniques to Bhorat et al. (2014) for our assessment of the second minimum wage shock, and because of this similarity in methodology, we now present a careful outline of the findings of their paper. This will create a platform for us to later compare the estimates of the impacts of the first and second minimum wage shocks.

Using a nationally representative dataset, Bhorat et al. (2014) estimate the impact of the agricultural minimum wage on farm worker employment and wages. The paper also investigates whether farmers responded to the new law by adjusting hours of work in order to manage the increased cost of labour. Besides wages, employment, and hours of work, the paper also assesses whether farm workers' working conditions improved as a result of the law. In their regression analysis the authors use two difference-in-differences specifications to assess the change in employment, wages, hours worked, and contract coverage in the post-policy period; firstly, the paper uses a standard treatment versus control specification, and secondly a Wage Gap[5] specification which avoids a number of the biases that might arise with the construction of a control group.

In their descriptive statistics, Bhorat et al. (2014) find initial evidence of policy impacts for farm workers. The descriptive statistics suggested negative employment effects, where the number of farm workers decreased by approximately 200 000 workers in the year that the minimum wage was introduced. Kernel density plots of wages indicated that hourly wages moved towards the minimum wage in the post-policy period. Despite this, the authors note that violation was a problem, as significant portions of the wage distributions remained below the legislated minimum wage in the post-policy period, thus a large number of farm workers were still being paid sub-minimum wages in the post-policy period. The summary statistics also indicated that contract coverage for farm workers was well below that of the control group, where only approximately 30 percent of farm workers had a written contract in the pre-policy period. Contract coverage increased notably in the post-policy period, with an increase of approximately 16 percent in the year following the implementation of the law. Another interesting change that was noted in the descriptive statistics was that the average usual hours of work per week tended to increase in the post-policy period for the group of farm workers. The authors suggest that this reaction indicates that farmers adjusted employment at the

[5]Similar to the methodology used later in this paper, the Wage Gap approach exploits the geographic variation in the pre-law farm worker conditions. To do this, the variable of interest is the Wage Gap, WG_j, defined as $WG_j = log[minimum(W_j^*)] - log[median(W_j^{'})]$, where W_j^* is the minimum wage in district j, and W_j' is the median farm worker wage in the year prior to the introduction of the law in district j. Therefore, larger Wage Gaps represent areas with lower pre-law wages. In other words, WG_j indicates how close a district's wages were to the minimum wage before it was implemented, and thus how extreme the area's adjustments would have to be in order to comply with the law.

extensive margin, but with more part-time workers losing their jobs than full-time workers, resulting in an increase in average hours of work.

The paper then performs a regression analysis using the treatment versus control and Wage Gap approaches. The econometric analysis reveals significant disemployment effects, and indicate that the probability of farm worker employment decreased more for farm workers in larger Wage Gap areas (those with lower pre-law median wages) than those in zero or low Wage Gap areas. The authors also find that the probability of farm worker employment was significantly lower in the post-law period, even in areas with a zero Wage Gap. This indicates that employment declined as a result of the policy even in areas where pre-law median wages were equal to the new minimum wage.

Secondly, the authors estimate the impact of the minimum wage law on wages, finding a significant increase in hourly wages for farm workers relative to control group workers. Using the Wage Gap specification the authors find that average wages increased more in areas with larger Wage Gaps than those with smaller Wage Gaps. Specifically, all else constant, farm workers earned on average 22 percent higher wages in the post-policy period in the treatment versus control specification, and the Wage Gap specification indicated that a one-unit increase in the Wage Gap resulted in an average wage increase of between 12 and 17 percent. Thus, not only did farm worker wages increase relative to the control group, they also rose significantly more in areas where the difference between the pre-law median wage and the new minimum wage was larger. This makes sense as farms in these areas would need to raise wages more than others in order to comply with the law. In terms of contract coverage, the regression analysis finds that while farm workers tended to have lower levels of contract coverage than control group workers in both the pre- and post-policy periods, farm worker contract coverage increased by over 7.5 percent on average in response to the law. The Wage Gap approach supported this evidence, where contract coverage increased overall in the post-law period, although there were bigger increases observed in areas with larger differences between the minimum wage and the pre-law median wage. Thus, stronger effects are again observed for areas with poorer pre-law conditions (larger Wage Gaps).

Lastly, the authors find that while farm workers worked on average 5.7 hours fewer than their control group counterparts at the outset, farm workers' usual hours of work increased in the post-policy period by approximately 5.5 hours per week. Hours increased significantly more in the post-policy period in large Wage Gap areas. However, the estimates indicated that hours of work decreased overall in the post-policy period for zero Wage Gap workers. The authors explain this phenomenon as a two-way adjustment. Firstly, overall hours of work declined in the post-law period as employers adjusted marginally at the intensive margin. Secondly, the increase in farm worker hours in areas with large pre-law Wage Gaps suggested a decrease in employment of part-time workers—driving average hours up—indicating an adjustment at the extensive margin that was biased towards part-time workers. This approach would have allowed farmers to manage their wage bills while retaining their more productive, full-time workers. Thus the response strategy was different for farms in large and small Wage Gap areas; farms in small Wage Gap areas lowered hours of work in order to manage costs as well as decreasing overall employment, while farms in large Wage Gap areas shed relatively more part-time jobs, resulting in an overall increase in average weekly hours.

Overall, Bhorat et al. (2014) find that the introduction of the agricultural minimum wage in 2003 had

a significant effect, raising wages by over 20 percent. The paper also finds that contract coverage in the industry was positively impacted by the law. However, the paper finds that the minimum wage resulted in decreased employment in the industry, where the probability of employment dropped particularly in areas with lower pre-law wages. It was also found that job losses were concentrated among part-time farm workers for large Wage Gap areas, where part-time workers fell from representing 23 to 6 percent of the farm worker sample between 2002 and 2003. By employing a very similar methodology and dataset to that of Bhorat et al. (2014), we later empirically investigate the impact of the agricultural sector's second major minimum wage shock, the 52 percent increase in the minimum wage in March of 2013. This will allow us to later compare the impacts of the two minimum wage shocks in chapter 5.

Besides Bhorat et al. (2014), a number of other papers also estimate the impact of the minimum wage in the South African farming industry using differing methodologies. Conradie (2003) investigates the short-run impacts of the minimum wage using a survey of wine farmers in two districts in the Western Cape six months after the legislation was brought into effect. The paper finds that both of the surveyed districts complied with the legislated minimum wage, noting that only one of the two districts needed to increase wages in order to comply, as the other was already paying minimum wage levels. The paper estimates the price elasticity of demand for farm labour at -0.30, and finds that a direct loss of employment was not necessarily a short-run outcome of the policy (with only a 1 percent decrease in employment), but that a slow-down in job creation was a bigger challenge resulting from the law (Conradie, 2003:20).

Murray and Van Walbeek (2007) use a survey of 103 sugarcane farmers in KwaZulu-Natal to assess the impact of the Sectoral Determination. In comparison to Conradie (2003), this paper adopts a medium-run perspective as their survey took place approximately two years after the implementation of the minimum wage. Murray and Van Walbeek (2007) distinguish between the North Coast, a higher wage paying area (Area A and B), and the South Coast, a lower wage paying area (Area B), and found that the effects of the law were similar in the two regions. The paper finds that farmers were generally unable to differentiate between the effects of the Sectoral Determination and other labour laws, and that mass retrenchments did not follow the introduction of the minimum wage. However, similar to Conradie (2003), the paper finds that employment reductions may have occurred through more implicit avenues and through a slowdown in job creation, for example where farmers often opted not to replace workers who left the farm (especially unskilled labourers) and cancelled projects (Murray and Van Walbeek, 2007:16). The paper found that a significant proportion of farmers reduced the hours of work in the working week, allowing them to pay hourly wages and reduce the effective wage. The paper also finds that in-kind benefits were reduced and that farmers were more likely to use seasonal workers after the minimum wage was implemented. Lastly, the paper found that farmers did not consider mechanisation to be a realistic alternative to farm worker employment due to its high costs, although farmers did consider chemical weed control to be an attractive alternative to manual weed control, due to rising wage costs (Murray and Van Walbeek, 2007:16).

In a longer run study (using nationally representative data from 1997 to 2007), Garbers, Burger and Rankin (2015) estimate the effect of the minimum wage on employment using a fixed effects approach. The paper finds significant evidence of decreased employment among formal unskilled farm workers, where employment decreased by approximately 20 percent for this group, of which 12 percent of job losses could be

attributed to the impact of the legislation on increasing formal unskilled farm wages (Garbers et al., 2015:31). The paper also finds evidence of skill and capital intensification resulting from the minimum wage, with a 9 percent increase in skilled farm worker employment (Garbers et al., 2015:31).

Thus, together the above four studies indicate that negative employment effects did follow the introduction of the farm worker minimum wage, although in the short-run these negative employment effects took the form of a slowdown in job creation, while distinct disemployment effects were observed after a longer period. Besides her paper assessing the impact of the minimum wage introduction, Conradie (2005) later estimates the wage elasticities of wine and table grape workers in order to assess the potential impact of a then proposed 10 percent increase to the farm worker minimum wage for 2005. The paper uses a sample of 190 wine and table grape farmers in the Western Cape. Conradie estimates the wage elasticity of employment at -0.33 for wine grape workers, and -0.59 for table grape workers. She also finds that seasonal workers have a greater wage elasticity than permanent workers. Thus, her paper predicted that the proposed 2005 increase in the minimum wage of 10 percent would result in small decreases in farm employment with sharper disemployment effects for seasonal and table grape workers, however she predicted that these decreases in employment would be offset by the increase in wages.

Another country that has encountered a similar inclusion of farm workers in general labour legislation as well as the introduction of a farm worker minimum wage is the United States. In the United States, on February 1^{st} of 1967, the agricultural labour force became covered by federal minimum wage laws as well as other general labour legislation for the first time under the Fair Labor Standards Act (Gallasch, 1975:480). This example is relevant to our case as it is in some way comparable to South Africa's expansion of labour legislation to farm workers in the 1990's. Gallasch (1975:490) and Gardner (1972:475) both assess the impact of this inclusion of the U.S. farming sector in the federal minimum wage law. Although the papers use differing methodologies, both studies find that employment declined significantly in response to the minimum wage, while wages were also found to increase significantly in both cases. Lianos (1972:482) investigates the impact of the policy for the Southern States specifically, which according to the paper paid lower wages in the pre-policy period and were therefore more vulnerable to employment declines following the extension of the federal minimum wage to the farm sector. The paper also finds that the minimum wage caused a decrease in farm labour employment, while the remaining employed workers earned higher wages.

Considering that very little literature investigates the impact of minimum wages in farming industries, it is useful to summarise some of the studies that assess the effects of minimum wages in other low-skilled sectors, for example minimum wages for domestic workers or the effects of minimum wages on teenagers. The following papers present some of these findings.

Dinkelman and Ranchhod (2012) study the impacts of the implementation of a domestic worker's minimum wage in South Africa using similar difference-in-differences techniques to those employed in this paper. The paper finds that wages increased significantly, yet there was no evidence of employment adjustments at either the intensive or extensive margin, despite the lack of monitoring and enforcement in the domestic work sector. Hertz (2005) also studies the effect of the domestic worker's minimum wage in South Africa, also observing increases in domestic worker wages, however in this case there is evidence of negative employment effects due to the minimum wage. Bhorat, Kanbur and Mayet (2013a) investigate the impact of

multiple sectoral minimum wages in South Africa, specifically minimum wages in the retail, domestic work, forestry, security, and taxi sectors. The paper finds some evidence of increased hourly wages for four of the five sectors, and does not find clear evidence of employment declines. The paper does find evidence of adjustments of usual hours worked, where average hours declined in the retail and security sectors.

From the international literature, Partridge and Partridge (1999) investigate the effect of minimum wage hikes on the low-wage (and low-skilled) retail industry in the United States using pooled cross-sectional state-level data. The paper focuses on the 1980's when many state-level minimum wages increased beyond the federal level. The paper finds that the minimum wage hikes resulted in reduced retail employment, and also finds that these hikes had an adverse effect on overall state employment growth. Zavodny (2000) investigates the impact of minimum wage increases on teenage employment, a generally low-skilled group. The paper finds that minimum wage increases may result in minor employment reductions amongst teenagers, but do not affect hours of work. Abowd et al. (1997) also study the impact of the minimum wage on wages and employment, particularly focusing on young low-wage workers. The paper investigates real minimum wage changes over time in France and the United States, and finds that changes in both the French and U.S. real minimum wages had significant employment effects, with particularly strong effects for workers earning wages close to the minimum wage.

Overall, the literature regarding rural employment and other low-skilled occupations presents mixed outcomes, finding either no employment effects or marginal declines in employment following minimum wages. In the case of agriculture in South Africa, the findings suggest that employment declined and that wages rose in response to the minimum wage introduction, while estimates of the wage elasticity of employment (from the period after the minimum wage was legislated) suggest that the decreases in employment resulting from a 10 percent minimum wage increase would be offset by increasing wages. The findings from the United States (a similar case study regarding labour legislation and minimum wages in the farming sector) indicate that farm worker employment declined in response to the minimum wage, specifically in states with lower pre-law wages. Other low-skilled occupations also present varying results, where in some cases minimum wages resulted in significant employment declines, while in other cases there were no employment effects.

2.3.2 Minimum Wages in other Developing Countries and Sub-Saharan Africa

Besides the literature in the most relevant industries (farming and other low-skilled occupations), it is also helpful to investigate minimum wage effects in similar countries. This section now goes on to review the literature from other Sub-Saharan African countries, as well as from other developing regions.

In their study of minimum wages in Sub-Saharan Africa (SSA), Bhorat, Kanbur and Stanwix (2017) find that minimum wages in SSA are generally aggressively set relative to the rest of the world, where many countries have high minimum wages relative to mean wages. The study finds that minimum wages generally have small or insignificant disemployment impacts, although these average effects can hide stronger effects. According to Bhorat, Kanbur and Stanwix (2017:28), large immediate increases in minimum wages are associated with large negative employment effects, while modest increases in the minimum wage are associated with little or no adverse employment effects. The paper notes that these variations are likely influenced by issues of enforcement and compliance. Also in the Sub-Saharan African context, Jones (1997)

investigates the Ghanaian minimum wage and finds significant disemployment effects within the formal sector (covered sector). The paper also presents evidence of a shift of workers from the formal sector to the informal sector following the decreased demand for formal labour as wages rise, resulting in a decrease in informal sector wages.

As was noted by Bhorat, Kanbur and Stanwix (2017), minimum wage compliance can be an important factor for the impact of the policy. Considering the issue of compliance and enforcement, Watanabe (1976) studies minimum wage effects in developing countries and finds that a major factor that determines the effectiveness and impact of minimum wages is the state and efficiency of enforcement of the law. The paper finds that poor enforcement, which is very often the case in developing countries due to financial and administrative constraints, prevents minimum wages from achieving their purpose of protecting vulnerable workers (Watanabe, 1976:357). Confirming this finding, Almeida and Ronconi (2012) find that labour inspections (the major vehicle for minimum wage enforcement) are generally inefficient in developing countries, and that small firms and firms with a greater proportion of low-skilled workers are least likely to be inspected.

In the Latin American context, Fajnzylber (2001) assesses the effect of the Brazilian minimum wage and finds stronger unemployment effects among informal sector workers than formal sector workers, particularly in the short-run, suggesting that informal sector workers may leave the informal sector to queue for formal sector jobs. Using the same dataset as Fajnzylber (2001), Lemos presents a series of papers analysing the minimum wage in Brazil. Lemos (2004:247) finds insignificant employment effects, with an almost zero estimate for employment elasticity. Neumark and Wascher (2006:107) accredits this difference in findings between Lemos (2004) and Fajnzylber (2001) as being due to Fajnzylber considering employment effects across the wage distribution, with the negative employment effects concentrated at the lower part of the distribution, while Lemos (2004) considers overall employment effects. In later papers, Lemos explores various methodologies when estimating the minimum wage effect. In attempting to control for the endogeneity of the minimum wage variable, Lemos (2005) uses a number of political measures as exogenous instruments for minimum wages. These estimates produce disemployment effects that are stronger with the use of the instruments, although the estimates are insignificant. Lemos (2007:717) estimates the effects of the minimum wage for the public and private sectors separately, and finds a compression of the earnings distribution, with no adverse employment effects. By estimating the employment effects for the formal and informal sectors separately, Lemos (2009) again finds that minimum wages in Brazil compressed the wage distribution—as wages increased at the bottom end of the distribution—for both formal and informal workers, and found no employment effects (Lemos, 2009:236). Overall, the evidence suggests that minimum wages in Brazil have resulted in little to no adverse employment effects, and that minimum wages have compressed the wage distribution (Neumark and Wascher, 2006:110), a promising finding for a country with distinctly high income inequality (Lam, 1999:4).

Mexico and Colombia present interesting minimum wage scenarios to study together because in the period between 1981 and 1987, Colombia's real minimum wage increased sharply, whereas Mexico's real minimum wage fell sharply (Neumark and Wascher, 2006:110). Bell (1997) investigates the impact of these changes, finding significant disemployment effects and wage increases for Colombia, with employment declines of between 2 and 12 percent for low-paid, unskilled workers (Bell, 1997:133). Bell finds no employ-

ment or wage effects in the Mexican case, and suggests that this is due to the fact that the Mexican minimum wage (being relatively low) was not an effective wage for the majority of firms or workers (Bell, 1997:131). Feliciano (1998) also investigates the impact of the falling real minimum wage in Mexico over the 1970 to 1990 period, finding no impacts for men. However, she does find significant increases in employment for women of all ages (Feliciano, 1998:178). In a study examining the impact of minimum wages on the earnings distributions of eight Latin American countries, Maloney and Mendez (2004) confirm Bell's findings regarding Colombia, finding marked wage distribution effects, as well as large negative employment effects for Colombia. Besides Colombia, the paper also finds that the minimum wage impacted the wage distributions of the remaining Latin American countries in the study, although Colombia presented the most extreme case (Maloney and Mendez, 2004:119).

A number of other studies have estimated the impact of minimum wages in other Latin American countries. Gindling and Terrell (2004) investigate the complex minimum wage system in Costa Rica, where in the period studied the minimum wage system went from having over 500 different minimum wages based on sector and skills level, to having only 19 distinct minimum wages (Gindling and Terrell, 2004:7). The authors find positive wage effects for covered workers, with marginal decreases in employment and hours worked (Gindling and Terrell, 2004:23). In the Chilean context, Montenegro and Pagés (2004) investigate the impact of minimum wages and job security provisions. Their evidence indicates that both job security and minimum wage laws are (paradoxically) detrimental, as they result in decreased job opportunities for young and unskilled workers, while increasing employment for skilled and older workers. The paper also finds that the minimum wage pushed women and unskilled workers out of wage employment and towards self-employment (Montenegro and Pagés, 2004:431). Strobl and Walsh (2003) assess the short-run impact of the introduction of the national minimum wage in Trinidad and Tobago in 1998, focusing primarily on compliance and only touching on employment effects. The paper finds significant non-compliance with the minimum wage, although wages increased for workers in large firms (Strobl and Walsh, 2003:447). In terms of employment, the study finds that males earning below the minimum wage had a 9 percent greater probability of job loss after the introduction of the minimum wage, while females had a close to zero increase in the probability of job loss as a result of the minimum wage (Strobl and Walsh, 2003:446).

Finally, in the Caribbean context, a number of papers have investigated the Puerto Rican minimum wage. Puerto Rico presents an interesting case study because in 1983 the minimum wage and minimum wage coverage standards, which had previously been significantly below that of the U.S., were brought up to mainland (U.S.) levels (Castillo-Freeman and Freeman, 1992:177). This would likely have had strong labour market impacts because, at the time, earnings on the island were only approximately two-thirds of U.S. earnings, resulting in a massive increase in the minimum wage to average wage ratio on the island (Castillo-Freeman and Freeman, 1992:177). This large increase in the minimum wage is particularly relevant to our study as we are interested in the impact of the large increase in the South African agricultural minimum wage. Castillo-Freeman and Freeman (1992:178) find significant declines in employment on the island, estimated at between 8 and 10 percent. Krueger (1994) presents similar findings in terms of the decrease in employment on the island, although the paper indicates that the evidence of a negative employment effect in the Puerto Rico case is fragile, where the strength and significance of the effect differs as the data and methodology

employed varies.

Lastly, we consider the literature that assesses the impact of the tripling of the nominal minimum wage in Indonesia in the 1990's (Rama, 2001:864). Again, this case is of interest as it is a sharp increase in the minimum wage, similar to South Africa's farm worker minimum wage hike. Rama (2001) finds moderate wage increases and employment decreases following the minimum wage hike, although the employment effect varied according to firm size, where smaller firms reduced employment significantly, while the evidence suggests that large firms increased employment (Rama, 2001:880). Alatas and Cameron (2008) find similar effects as their results indicate that larger firms did not reduce employment, while smaller firms did. Suryahadi et al. (2003) distinguish between the formal and informal sectors and find disemployment effects among urban formal workers, with the greatest impact amongst young, unskilled females, while employment prospects for white-collar workers improved as a result of the minimum wage hike (Suryahadi et al., 2003:46). The paper also finds spillover effects, where some displaced formal sector workers moved to the informal sector, where they earn lower wages and endure poorer working conditions (Suryahadi et al., 2003:47).

Overall, from the South African context we encountered varying empirical findings regarding the effects of minimum wages on labour market outcomes, with either no employment effects or disemployment resulting from minimum wages. The developing country literature, specifically in the context of large minimum wage hikes, indicated employment losses following minimum wages. Lastly, also in the case of the developing country context, minimum wage violation was identified as an important determinant for the effectiveness and impact of minimum wage policies.

Chapter 3

Theoretical Overview of Minimum Wage Effects

Theory predicts various labour market adjustments that could take place following a minimum wage shock in a sector. Firstly, economic theory tells us that in a market of perfect competition, if the price of a commodity is forced above market clearing levels, consumers will respond by decreasing demand accordingly. In our case, farm workers represent the commodity, wage levels represent the price, and farms/farmers represent the demand for labour. Thus, basic price theory suggests that an increase in the agricultural minimum wage to a value above market clearing wage levels will result in decreased employment as farmers reduce their demand for labour. Assuming full compliance with the minimum wage (perfect enforcement), the extent to which employment declines will follow a minimum wage increase will depend on the price elasticity of the demand for labour, which measures how sensitive the demand for labour is to the price of labour (Brown, 1999:2103). If the absolute elasticity of demand exceeds one then labour demand is highly sensitive to the wage, and a one percent increase in the minimum wage will result in a more than one percent decrease in employment. However, if the absolute elasticity of demand is less than one, then labour demand is insensitive to the price of labour, and a one percent increase in the minimum wage will result in a less than one percent decrease in employment.

The price elasticity of demand for agricultural workers will depend on a number of variables. To operate sustainably, farm owners must generate a return that is sufficient to pay for the farming inputs that are used in production (such as fertiliser), labour, capital (such as tractors or land), as well as profit remaining as remuneration for the entrepreneur. If the cost of any one of these factors increases, for example in the case of a minimum wage increase (making labour relatively more expensive), the owner generally has four choices which can be applied alone or in combination; he can decrease the return to one of the other factors (for example, reduce the return to own equity), change the ratio of the factors (adjust the employment of labour and capital), increase productivity, or exit the market. The strategy that the farmer takes will depend on factors such as access to credit, the availability of technology, and the substitutability of capital and labour. Thus, even if the technology that can substitute labour exists, if the farmer does not have access to the

credit necessary to obtain it, employment could stay fixed (reflected in a lower elasticity of demand for labour). However, if capital is accessible, or the farmer decides to cut back on production or exit farming, then the result will be a decrease in employment, either at the intensive or extensive margin, or both. Thus overall, if these factors result in labour that is highly substitutable and farmers are able to replace workers for alternatives, the demand for labour will be elastic. On the other hand, if labour is not easily substitutable, the demand for labour will be inelastic. Depending on whether the demand for labour is elastic or inelastic, employment is either expected to decrease (elastic) or at best stay constant (inelastic). In most cases we would expect employment to decrease on aggregate, as labour is generally substitutable to some degree.

By similar reasoning, hours of work may shift up or down, depending on the strategy and aggregate employment adjustments of farmers. For example, where farmers decrease the number of employed farm workers, the farmer may simultaneously increase the number of hours worked by the remaining employees to offset the loss in productivity. Alternatively, farmers may choose to hire or fire either a greater proportion of full-time or part-time workers in response to the law and this will cause a shift in the average hours worked, even if the remaining workers keep their hours constant. For example, in the case that more part-time workers lose their jobs, average hours will increase because proportionately more full-time workers remain in the industry.

Another factor that will influence the disemployment effect is violation, where farmers pay workers wages that are below minimum wage levels. Ashenfelter and Smith (1979) find that the level of compliance with minimum wage legislation is important, and that non-compliance creates a de facto uncovered sector. The presence of an uncovered sector (employers who are paying wages below the minimum wage) can serve to dilute the disemployment effect, as the workers who lose their covered sector (minimum wage paying) jobs move to employment in the lower paying uncovered sector (Brown, 1999). The degree of non-compliance will depend on the effectiveness of the enforcement of the minimum wage and the penalties that farmers will incur if caught violating the law (Ashenfelter and Smith, 1979:335).

Besides the impact on employment, minimum wage laws are also expected to influence the variables that the law specifically deals with, for example, wages, overtime pay, employment contract requirements, payments in kind, and hours of work. In each case, we expect that since the legal obligation of the farmer is to meet the requirements of the minimum wage law (Sectoral Determination 13), that these conditions will be met. For example, we expect that wages should increase with an adjustment of a minimum wage law, and that there should be more workers with written contracts that conform to the requirements of the law, if workers were being paid wages below the minimum wage level or did not have written contracts prior to the implementation of the law. Farmers may also respond to the law by offsetting the higher wages with payments in kind, for example in the form of housing, produce or clothing. In the case of Sectoral Determination 13 however, the legal limit of payment in kind is 10 percent of the wage, thus payment in kind should not exceed this.

Lastly, considering these effects, minimum wage laws will also impact the welfare of farming communities. Increased wages and improved employment conditions will have a positive welfare effect for farming communities, for example, as higher incomes are distributed to farming families. On the other hand, disemployment effects will have a negative impact on welfare, as fewer wages are distributed to the community

and as unemployment rates rise. The overall welfare effect will depend on the elasticity of demand for labour (how strong the wage and employment effects are relative to each other), and the extend to which the minimum wage law is complied with. Thus, whether there is a net positive or negative welfare effect is an empirical question.

Overall, theory presents conflicting effects of a minimum wage shock. Negative effects may derive from disemployment (and this will depend on the elasticity of demand for labour), decreased hours of work, or increased non-monetary payments. On the other hand, positive effects include increased wages, which not only impact farm workers directly, but also farming communities as a whole. Besides the income effects, other aspects of the law may improve farm worker welfare, for example, improved contract coverage and regulated working hours. The effect of a minimum wage will be further influenced by the degree of compliance with the law. For our analysis of the 2013 agricultural minimum wage hike, we hypothesise that employment will be negatively impacted by the minimum wage, or at best there will be no significant employment effect, as farmers either maintain employment levels, or adjust employment downwards to manage labour costs. We hypothesise that wages and contract coverage will be positively impacted by the minimum wage law, as farmers increase wages and written contract coverage in order to comply with the law.

Chapter 4

South Africa's Agricultural Minimum Wage Hike

We will now go on to empirically estimate the impact of the second agricultural minimum wage shock—the review of Sectoral Determination 13 in 2013, when the farm workers' minimum wage increased by 52 percent. The following section will present the data and methodology used in the assessment, and will then present the descriptive and econometric findings.

4.1 Data and Methodology

4.1.1 Labour Market Dynamics in South Africa

The dataset used in the study is the Labour Market Dynamics in South Africa (LMD); this dataset is produced annually and is based on the Quarterly Labour Force Survey (QLFS), administered by Statistics South Africa. The data includes information concerning each surveyed individual's employment status, wage, hours of work and other labour market indicators, as well as their demographic details, making it useful in the current context. The survey is completed on a quarterly basis and the chosen sample uses data from 2012 to 2014, and the various quarters will be treated as pooled cross-sections. This dataset is used for all major descriptive and econometric analysis. The 2008 to 2011 LMD data is also used briefly in order to estimate agricultural employment levels for that period (figure 1.1). The methodology applied in the econometric analysis requires the identification of geographic information, specifically the district council of each employee. Since this information is not publicly available in the LMD, special permission and access was given by Statistics South Africa for this data to be used in the project. At no point is the data disaggregated beyond the district council level, thus the anonymity of the data is never compromised in the analysis.

Statistics South Africa's Consumer Price Index (CPI) is used to generate the real earnings for each individual. All nominal earnings are converted to March 2013 Rands, which corresponds to the time of the implementation of the minimum wage adjustment, allowing us to directly compare all reported wages with the

quoted minimum wage of R11.66. Since the dataset does not provide information on the month of interview, the CPI for each month of each quarter is averaged and these averages are used to construct a deflator variable that is then used to calculate real wages. Where individuals reported their income as a bracket amount rather than a rand value, the rand amount is estimated by random allocation along the uniform distribution within the given bracket, in order to maintain variation and to avoid losing useful observations. Individuals reporting zero or missing incomes are excluded from our sample. Lastly, unless otherwise specified, for the remainder of the paper, hours of work reflects the reported usual weekly hours of work, and wages reflects real hourly wages. In both cases outliers have been removed, where outliers are defined as the first and last 1 percent of the hours and wage distributions.

As we mentioned in Section 1, it is possible that any changes in agricultural employment over the period of interest may have resulted from changes in other factors, such as increases or decreases in productivity, or changes in harvest outcomes and weather conditions. To avoid picking up these effects in the regression results we must control for some measure of productivity and output.

Table 4.1: Real Provincial Agricultural Value Added

Region	**2012**	**2013**	**2014**	**Average Yr-on-Yr % Change**	**Overall % Change**
Western Cape	16477	16430	17024	1.7	3.3
Eastern Cape	4186	4017	4551	4.6	8.7
Northern Cape	4876	4676	5298	4.5	8.7
Free State	7114	7176	7680	3.9	8.0
KwaZulu-Natal	19295	19304	19764	1.2	2.4
North West	4999	4941	5584	5.9	11.7
Gauteng	4580	4588	5082	5.5	11.0
Mpumalanga	6717	6801	7093	2.8	5.6
Limpopo	5740	5530	5490	-2.3	-4.4
Total	73984	73464	77567	3.1	6.1

Source: Statistics South Africa (2016), own calculations (real values, reflected in 2013 constant prices).

In order to account for any changes and growth in the agricultural sector we have obtained Statistics South Africa's estimates of the provincial value added (PVA) for the sector over the period of interest. These estimates are displayed in Table 4.1. Relative to GDP growth of 2.1 percent on average between 2012 and 2014 (Statistics South Africa, 2017a:9), agricultural growth of 3.1 percent on average for the same period was relatively strong. This pattern of growth was consistent overall and across the provinces, except for Limpopo where PVA declined slightly. As is later mentioned, these estimates of PVA are used as controls in all regressions to ensure that our results are not contaminated by growth or productivity effects that may have impacted employment in the sector.

4.1.2 Methodology

The paper will first use a combination of descriptive statistics to establish the basic changes in the various labour market indicators over time, including various summary statistics and kernel density plots. We will then use regression analysis to estimate the minimum wage effects while controlling for various factors, thus isolating the effects of the policy on the outcomes of interest, namely employment, wages, hours of work and contract coverage.

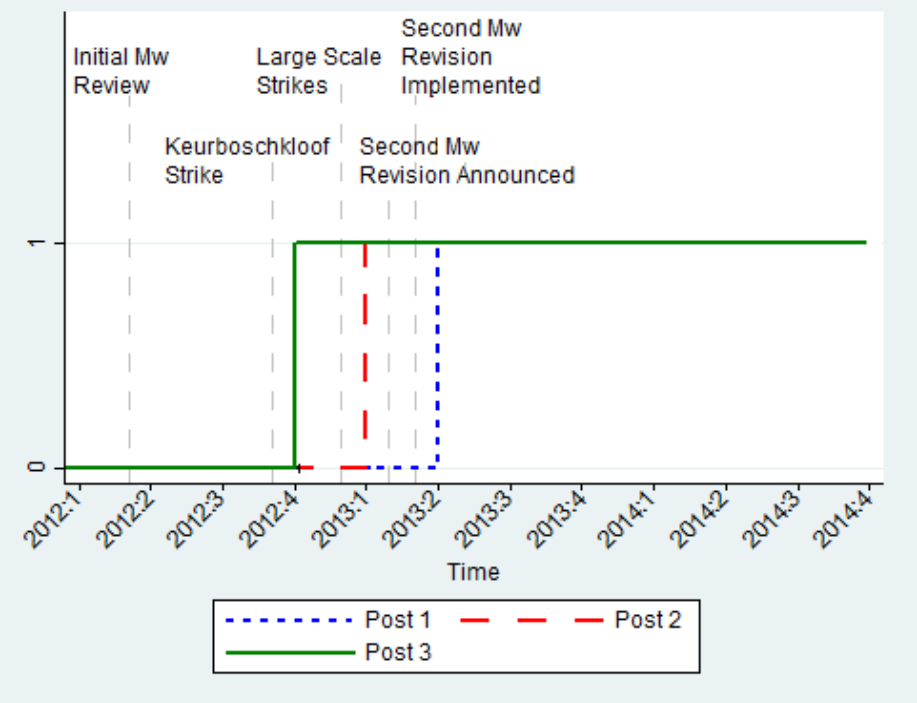
In order to isolate the effect of the minimum wage increase on these labour market outcomes, a difference-in-differences approach is used. The objective of this identification strategy is to compare the movements in some outcome of interest for a treated group, to the movements in this outcome for a similar but untreated group (the control group). If it can reasonably be assumed that in the absence of the policy the two groups would have continued to move in a similar way, then any deviations from this parallel movement can be attributed to the policy itself. The control group thus forms a counterfactual for what might have happened to the treatment group, had the policy not been in place. In this case, the treatment is the increase in the farm worker's minimum wage that occurred in 2013, the treated group are all affected workers employed in the agricultural sector, and the control group is a group of workers that have similar demographic and occupational characteristics to the affected farm workers. The specifics of the treatment and control groups will be elaborated on later.

Expectations Model

Before presenting the specifics of the difference-in-differences methods we present how our model accounts for the possibility that farmers may have expected a significant minimum wage hike. The turmoil and strikes surrounding the minimum wage adjustment were covered extensively by national media. These disruptions (and the subsequent media coverage) began in August of 2012, eight months prior to the legislated minimum wage increase, and would have signalled to farm owners that the Sectoral Determination would likely be revised, specifically resulting in a higher minimum wage. For this reason, we define a model that allows for farmers to have anticipated the minimum wage increase, and to have reacted by adjusting their operations in the period before the minimum wage hike legally came into effect. In all of the following regression specifications we explore three different forms of the $Post_{kt}$ period, where $k = 1, 2, 3$. Firstly, using $Post_{1t}$ we indicate the time period before and after the second quarter of 2013, the closest period in the data to the legal implementation of the minimum wage hike (1^{st} March 2013), indicating a one for any time after the 1^{st} of April 2013 and a zero before this point. Secondly, we define the $Post_{2t}$ variable as before and after the first quarter of 2013, indicating a one for any time after the 1^{st} of January 2013 and a zero elsewhere. Lastly, $Post_{3t}$ is defined as before and after the fourth quarter of 2012, indicating a one for any time after the 1^{st} of October 2012 and a zero elsewhere. Separate regressions are run for each of the three $Post_{kt}$ definitions for all outcomes Y_{it}. Thus, $Post_{2t}$ and $Post_{3t}$ will indicate whether farmers began making operational adjustments in expectation of a minimum wage increase for up to two quarters prior to the legal change. This method is similar to that of Bhorat and Lilenstein (2016), who also develop an expectations model which identifies whether employers react in anticipation of new legislation.

Figure 4.1 illustrates the three definitions of the post treatment period, and thus the expectations model, showing the periods in which each of the three binary $Post_{kt}$ variables are zero and one. As we can see from the figure, $Post_{1t}$ represents the time period closest to the legislated change in the minimum wage. $Post_{2t}$ represents one quarter prior to the legislated minimum wage change, and as we can see in this period the revision to the minimum wage was announced—thus farmers had already become aware of the new minimum wage level, and could have started making adjustments based on this prior knowledge. Lastly, $Post_{3t}$ represents two quarters before the legislated minimum wage increase, and within this period large scale strikes in the sector had begun and negotiations were also beginning to take place, therefore farmers may have begun making adjustments in response to the strike and negotiation activity. Using a model such as this enables us to analyse the dynamics of how employers adapt operations to accommodate minimum wages, rather than simply assuming a one-time adjustment to the legislation.

Figure 4.1: Expectations Model and Event Timeline



Source: Own calculations.

Difference-in-Differences: Treatment versus Control

The econometric approach uses two difference-in-differences methodologies. Firstly, we present the classic treatment versus control group approach, where a counterfactual for the treatment group is manually constructed, and secondly we use a Wage Gap approach that avoids the use of a counterfactual. Here we describe the treatment versus control approach.

For this specification the treatment group is defined as all unskilled farm workers within the working

age population. We limit our sample to unskilled farm workers, as this is the group for whom the minimum wage will most likely be an effective wage. Farm workers are identified using their International Standard Industrial Classification (SIC) and South African Standard Classification of Occupations (SASCO) codes, reported in the survey. The control group is defined as individuals who are as similar as possible to the average farm worker in terms of job description and demographic profile. The control group thus includes all workers in unskilled ("elementary") occupations according to their SIC and SASCO codes. The control group is also limited to workers with no more than 12 years of education, workers who earn less than R10 000 real income per month, workers between the ages of 15 and 64, and non-union employees. Lastly, we remove all workers who are employed in occupations that are covered by another Sectoral Determination (for example, taxi drivers and domestic workers), to avoid any confounding effects. This control group thus includes low skilled, low educated, vulnerable workers who are in many ways similar to the average farm worker. Examples of workers who would fall into the control group would be construction workers, packers or street vendors. For the remainder of the paper, farm workers and control group workers are defined in this way.

The treatment versus control difference-in-differences specification is as follows:

$$Y_{it} = \beta_0 + \beta_1 Post_{kt} + \beta_2 farmworker_{it} + \beta_3 Post_{kt} * farmworker_{it} + \boldsymbol{\delta X_{it}} + \epsilon_{it} \qquad (4.1)$$

Where Y_{it} is the labour market variable of interest, namely employment, the natural logarithm of real hourly wages[6], usual weekly hours of work and contract coverage. In the case of employment and contract coverage, specification 4.1 takes the form of a linear probability model[7]. In the case of earnings, we take the natural logarithm of the real hourly wage as this normalises the distribution of wages, and thus the error term, ϵ_{it}, and the logged form of wages is also preferable for interpretation of the coefficients. In general, $farmworker_{it}$ is one for individuals employed as farm workers (treatment group) and zero for those in the control group, defined above. However, when we consider employment as the dependent variable, $farmworker_{it}$ takes on a one for agricultural workers and a zero for the control group and unemployed individuals who are actively seeking work. This allows workers to switch jobs (between employment in control jobs and farm work) as well as for employment to be gained or lost. When employment is the dependent variable we also limit the sample to only including African individuals. As was previously mentioned, $Post_{kt}$ is a dummy defined in three different ways, depending on the period in which we expect farmers to have begun adjusting their operations. $\boldsymbol{X_{it}}$ is a vector of controls, including age, education, race and gender. $\boldsymbol{X_{it}}$ also includes quarterly dummies to control for seasonality as well as provincial agricultural value added for each of the three years, as is quoted in Table 4.1.

Overall, for specification 4.1, if the effect of the second minimum wage had a significant impact on the dependent variable, Y_{it}, we expect to see this change reflected in the difference-in-differences estimator $\boldsymbol{\beta_3}$—the change in Y_{it} for the farm worker group, relative to the control group, in the period $Post_{kt}$.

[6]For the remainder of the paper, "log" refers to the natural logarithm.

[7]In all regressions where we have a binary dependent variable (employment and contract coverage), the linear probability model is presented for ease of interpretation. However, the Logit and Probit models were also estimated and present similar estimates in terms of coefficient sign and significance.

Difference-in-Differences: Wage Gap

Besides the basic treatment versus control approach described in equation 4.1, we present a second difference-in-differences model that exploits the geographical variation in the labour market conditions across the South African agricultural industry, namely the Wage Gap approach.

The agricultural industry is highly unique in the sense that very distinctive factors influence its production levels and labour force demand, for example droughts or poor harvest outcomes. Because of this, it is very difficult to manufacture a control group that accurately provides a counterfactual for the farm worker group, as most industries would not be influenced by variables such as droughts in the same way as the farming industry would be. Therefore, the Wage Gap approach provides a major advantage over the control versus treatment approach, as it does not rely on a manufactured control group, which may not be truly reflective of a counterfactual for the farm worker group, considering the uniqueness of the sector. Besides the weak control group, the Wage Gap approach is also used given concerns about factors that may contaminate control group estimates, for example possible spill over effects and migration between the control and farming sectors.

The Wage Gap[8] specification looks as follows:

$$Y_{it} = \beta_0 + \beta_1 Post_{kt} + \beta_2 WG_j + \beta_3 Post_{kt} * WG_j + \boldsymbol{\delta X_{it}} + \epsilon_{it} \tag{4.2}$$

Where Y_{it} is the outcome of interest (log of hourly wages, employment as a farm worker, etc.), $Post_{kt}$ is the post-period defined according to the previously described expectations model, and $\boldsymbol{X_{it}}$ is a vector of controls, again including age, education, race and gender, quarterly dummies to control for seasonality, and provincial agricultural value added for each of the three years. WG_j is defined as follows:

$$WG_j = log[min(W)] - log[median(W_j)] \tag{4.3}$$

Where $min(W)$ is the updated hourly minimum wage of R11.66 and $median(W_j)$ is the real pre-law (2012) median agricultural wage in district j. To be specific, we calculate $median(W_j)$ by finding the 2012 median agricultural wage for each district, thus WG_j is a form of the distance between the new minimum wage and the pre-law median district wage for agricultural workers for each district j. The median is used as it presents a proxy for wages in each district and it is not biased by outliers at the extreme ends of the wage distribution. A positive Wage Gap indicates a district with low median wages in 2012 (relative to the new minimum wage), and a negative Wage Gap indicates a district with high median wages in 2012. We expect that areas that have positive Wage Gaps will adjust operations more sharply than those with negative Wage Gaps, because farmers in these areas would need to make bigger adjustments to their operations in order to comply with the new minimum wage. Thus, we expect to find that β_3 is significant in specification 4.2.

[8] A similar approach was first employed by Card and Krueger (1994) who exploited geographic variation in their difference-in-differences estimator to test the effects of a minimum wage increase in the American Fast Food industry. In the South African context, the Wage Gap approach has been used numerous times in the minimum wage context, specifically by Dinkelman and Ranchhod (2012) for the domestic worker's minimum wage, Bhorat et al. (2014) for the agricultural minimum wage, and Bhorat, Kanbur and Mayet (2013a) who look at minimum wage impacts in various sectors. Strobl and Walsh (2003) also use a similar approach when assessing the impact of the introduction of the national minimum wage in Trinidad and Tobago.

In this way, the Wage Gap variable, based on the district council data supplied by Statistics South Africa, allows us to identify spatial variation in pre-law wages and use this variation to isolate the effect of the new minimum wage on the various labour market outcomes.

Following from the theory section, for both the treatment versus control and Wage Gap approaches we hypothesise that $\boldsymbol{\beta_3}$ will be negative in the employment regressions and positive in the wage and contract regressions. We hypothesise that $\boldsymbol{\beta_3}$ will be negative in the hours worked regressions, assuming that farmers shed relatively more part-time labour (following the strategy that Bhorat et al. (2014) observed for the first shock). We also hypothesise that these effects will be greater for large Wage Gap areas, as farmers in these areas will need to adjust operations more drastically in order to comply with the law.

An Index of Minimum Wage Violation

Lastly, we will briefly estimate the violation and the depth of violation in the sector. To do this, we will draw from the methodology of Bhorat, Kanbur and Mayet (2013b), who assess minimum wage violation in various sectors in South Africa. The paper defines individual violation as follows:

$$v(w^m, w) = \begin{cases} v(w^m, w) = [(ln(w^m) - ln(w))/ln(w^m)]^\alpha & \text{if } w < w^m \\ 0 & \text{if } w \geq w^m \end{cases} \tag{4.4}$$

Where w^m is the relevant hourly minimum wage, w is the individual hourly wage and α is greater than or equal to zero. In this case, v is only greater than zero when the worker is paid less than the minimum wage, thus in cases of violation. We are interested in $\alpha = 0, 1, 2$; when $\alpha = 0$ v simply becomes an indicator for violation or non-violaion, when $\alpha = 1$ v indicates the fraction that the wage is below the minimum wage, and when α is greater than one v becomes more sensitive to larger wage gaps (wages that are a greater distance below the minimum wage). Thus when $\alpha = 2$ v represents the squared distance between the wage and minimum wage, highlighting extreme violation.

In order to estimate each violation index on aggregate, we calculate the expected value of each index over the various periods, specifically:

$$V_\alpha = E[v(w^m, w)] \tag{4.5}$$

V_0 calculates the proportion of workers earning below the minimum wage, V_1 calculates the average gap between violated workers' wages and the prevailing minimum wage, and V_2 calculates the average depth of the gap between violated workers' wages and the prevailing minimum wage. The estimator V_1/V_0 enables us to interpret V_1 as it reflects the average percentage shortfall of violated workers' wages from the minimum wage (Bhorat, Kanbur and Mayet, 2013b:194).

4.2 Descriptive Statistics

We now go on to consider the profile of the labour force in the agricultural and control group environments. The summary statistics in Table 4.2 outline the average characteristics of the farm worker and control groups.

As has been noted, the key motivation behind a minimum wage is to protect a group of workers who are largely unorganised and susceptible to exploitation, and who thus receive relatively low wages and experience poor working conditions. From the summary statistics we find evidence that the group of farm workers generally does fall into this category, where although there are demographic similarities between the farm and control group workers, we observe various differences in their employment indicators, for example lower wages.

Demographically, we observe various similarities between the two groups. The average age of both groups is between 35 and 37 years old. Both groups are also majority male, although there are slightly more females working in the agricultural industry. Both groups also have a high proportion of African workers, historically the most disadvantaged group, however the control group employs slightly more Africans. Agricultural workers tended to have only 7 years of completed education, which is approximately a primary school certificate. This may be the result of farm communities being located in rural areas where access to services such as schooling is relatively poor (Chisholm et al., 2004:206), as well as the fact that less schooling is generally required for employment as a farm labourer. Although control group workers had around 2 years more education than farm workers, the control group's average education was also relatively low, remaining well below a high school certificate. Combined, these demographic variations (lower education and higher female employment among farm workers) can contribute to a wage differential between farm and control group wages. We also observe that union membership is very low for the farm worker group, with membership rates of between 3 and 6 percent. This presents evidence that labour in the farming sector is highly unorganised, and that farm labourers generally have weaker bargaining power—another reason that wages tend to be low among farm workers[9].

The employment variables indicate clear differences between the two groups. Firstly, with regard to usual weekly hours worked, we observe that farm workers generally work very high weekly hours, considering that Sectoral Determination 13 limits a usual farm worker week to 45 hours. It is clear that this limit is exceeded often amongst farm workers, where average hours per week are between 46 and 47 hours, suggesting that many farm workers are regularly working overtime. This is again clear in Figure 4.2, which plots the distribution of usual hours worked for farm workers for the three years. From the figure, we observe that a significant proportion of workers exceed 45 hours (represented by the orange vertical line) per week in their usual work weeks, with spikes in the distribution as high as 50 and 60 hours per week. In this case, we should see average wages driven up due to payment of overtime rates, where employers are required to pay 1.5 times the worker's usual wage (for up to 15 overtime hours per week) (Department of Labour, 2006:13), however the descriptive statistics do not indicate this. Table 4.2 also indicates that there are very few part-time workers amongst the agricultural sample, whether we define part-time workers as working 27, 35 or 40 hours and less. This follows from the findings of Bhorat et al. (2014) who observe that a large proportion of

[9]Recall that the control group is explicitly defined to exclude any union members: thus, while some workers are union members in the farm group (albeit a small proportion), none of the control group workers are unionised.

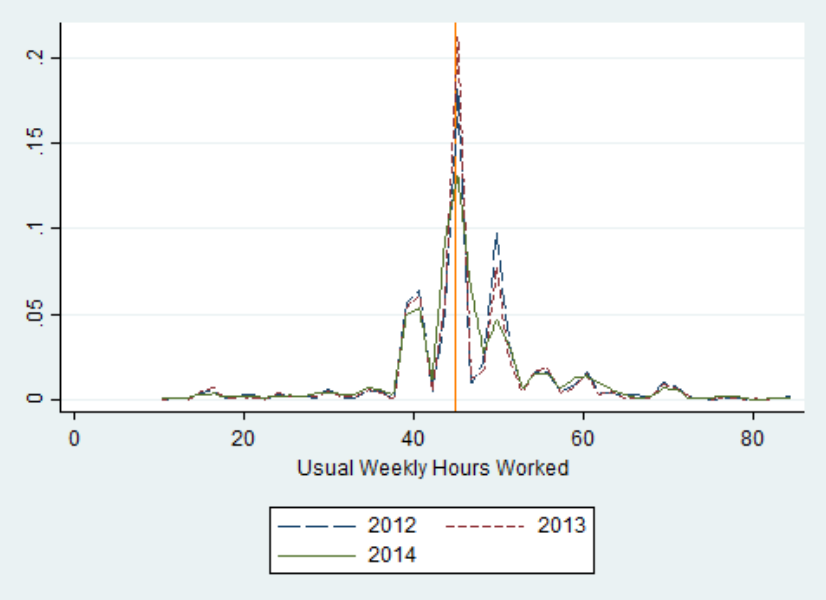
Table 4.2: Summary Statistics, Farm and Control Group Workers

Farm Workers	**2012**				**2013**				**2014**			
	Q1	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
N	811	722	768	806	794	783	816	812	851	807	822	828
Weighted ('000)	490.8	458.5	483.9	497.6	529.6	502.4	485.3	487.4	485.3	476.4	479.3	507.9
Quarter to quarter change	-	-0.07	0.06	0.03	0.06	-0.05	-0.03	0.00	0.00	-0.02	0.01	0.06
Below Prevailing Minimum Wage	0.59	0.67	0.67	0.68	0.63	0.82	0.80	0.79	0.80	0.77	0.76	0.76
Age	36	36	36	36	35	36	36	36	37	37	37	36
Education	7.2	7.3	6.7	6.8	7.5	6.8	6.7	6.9	6.5	7.0	7.0	7.2
Male	0.64	0.64	0.63	0.64	0.63	0.66	0.64	0.66	0.65	0.66	0.65	0.65
African	0.77	0.82	0.78	0.79	0.78	0.76	0.75	0.71	0.73	0.75	0.73	0.75
Rural	0.73	0.73	0.76	0.80	0.78	0.77	0.78	0.72	0.69	0.74	0.73	0.75
Union	0.03	0.04	0.05	0.03	0.05	0.05	0.05	0.06	0.06	0.06	0.05	0.03
Usual Hours Worked	46	47	47	46	47	46	46	46	47	46	46	47
Real Monthly Wage (Rand)	1760	1640	1695	1508	1823	1779	1832	1967	1863	1866	2078	2156
Real Hourly Wage (Rand)	9.1	8.3	8.4	7.8	9.3	9.2	9.7	10.1	9.6	9.8	11.1	10.8
Contract Coverage	0.61	0.63	0.66	0.62	0.69	0.67	0.67	0.67	0.66	0.67	0.68	0.64
Prop $\leq$27 hours	0.03	0.03	0.02	0.04	0.024	0.03	0.04	0.04	0.03	0.04	0.04	0.02
Prop $\leq$35 hours	0.06	0.05	0.04	0.07	0.04	0.06	0.08	0.06	0.07	0.07	0.06	0.06
Prop $\leq$40 hours	0.23	0.21	0.22	0.22	0.173	0.22	0.24	0.24	0.24	0.27	0.28	0.20
Control Group												
N	1329	1312	1252	1268	1271	1265	1298	1342	1299	1332	1341	1330
Weighted ('000)	966.3	934.2	858.8	860.5	856.58	852.8	900.6	943.1	943.6	956.9	948.8	961.6
Quarter to quarter change	-	-0.03	-0.08	0.00	0.00	0.00	0.06	0.05	0.00	0.01	-0.01	0.01
Age	35	35	35	36	36	36	36	36	36	37	37	37
Education	9.3	9.2	9.1	9.0	8.9	8.8	8.9	9.1	8.9	8.8	8.8	8.9
Male	0.72	0.73	0.72	0.71	0.68	0.68	0.69	0.68	0.68	0.71	0.66	0.67
African	0.86	0.86	0.85	0.86	0.86	0.85	0.87	0.85	0.86	0.87	0.85	0.87
Rural	0.25	0.24	0.27	0.27	0.28	0.27	0.27	0.29	0.29	0.30	0.33	0.33
Usual Hours Worked	41	41	42	41	40	40	39	39	39	38	39	39
Real Monthly Wage (Rand)	2417	2389	2183	2250	2055	2122	2039	2079	2105	2015	1962	1937
Real Hourly Wage (Rand)	13.9	13.6	12.4	13.0	12.2	12.5	12.3	12.5	12.5	12.2	12.0	11.6
Contract Coverage	0.62	0.62	0.62	0.6	0.59	0.62	0.65	0.67	0.71	0.64	0.69	0.65
Prop $\leq$27 hours	0.15	0.14	0.13	0.15	0.177	0.18	0.19	0.19	0.18	0.22	0.23	0.22
Prop $\leq$35 hours	0.21	0.19	0.19	0.21	0.24	0.26	0.27	0.26	0.26	0.3	0.29	0.29
Prop $\leq$40 hours	0.52	0.55	0.53	0.56	0.583	0.58	0.59	0.59	0.63	0.64	0.62	0.61

Source: Labour Market Dynamics in South Africa (2012 - 2014b), own calculations (real values, reflected in 2013 constant prices). All estimates are weighted using sampling weights. The dashed line represents the closest period in the data to the legal implementation of the agricultural minimum wage increase, quarter two of 2013.

the job shedding that followed the introduction of the minimum wage was from amongst part-time workers, thus the proportion of part-time workers dropped dramatically after 2003[10].

Figure 4.2: Distribution of Usual Weekly Hours Worked for Farm Workers



Source: Labour Market Dynamics in South Africa (2012 - 2014b), own calculations. All estimates are weighted using sampling weights. The orange line represents 45 hours, the limit for the usual weekly hours of work for farm workers according to Sectoral Determination 13.

Table 4.3 indicates the average hours worked per year within various Wage Gap bands. From the table we observe that the highest average hours are generally worked in high Wage Gap areas; close to 50 hours are worked in the fourth band, where median pre-law agricultural wages were between R5.23 and R6.40 per hour (Wage Gaps of between 0.6 and 0.8), which is significantly lower than the prevailing minimum wage of R11.66. We also note that farmer labourers work significantly more hours than their control group counterparts who usually work on average between 39 and 41 hours per week.

Besides the actual level of hours worked, neither the summary statistics nor the kernel density plots presented in Table 4.2 or Figure 4.2 suggest that the hours worked distribution changed in or after 2013, as average hours remained stable at between 46 and 47, and the distribution stayed relatively fixed over 2012, 2013 and 2014 in Figure 4.2.

Besides hours worked, Table 4.2 indicates that contract coverage is relatively similar across the two groups, where both the majority of farm workers and control group workers have a written contract. In both groups the proportion of workers with a contract tended to increase slightly over the three years, with coverage remaining roughly between 60 and 70 percent over the period. Interestingly, Bhorat et al. (2014) observe relatively low initial levels of both contract coverage and hours worked, and find major increases in both variables following the minimum wage introduction. In the case of hours worked, hours seem to have stabilised at the post-policy levels observed by Bhorat et al. (2014): approximately 47 hours. Contract

[10]Bhorat et al. (2014) define part-time workers as those working fewer than 27 hours per week.

Table 4.3: Average Hours Worked by Wage Gap Category

WG Range	2012 Mean Hours	2013 Mean Hours	2014 Mean Hours
WG $<$ 0.2	45	44	44
0.2 $\leq$ WG $>$ 0.4	44	45	45
0.4 $\leq$ WG $>$ 0.6	46	45	46
0.6 $\leq$ WG $>$ 0.8	50	49	49
WG $\geq$ 0.8	49	46	44
Overall	47	46	46

Source: Labour Market Dynamics in South Africa (2012 - 2014b), own calculations. All estimates are weighted using sampling weights. WG denotes the Wage Gap gap as is defined in Section 4.1.2, specifically $WG_j = log[min(W)] - log[median(W_j)]$, representing the difference between the log of the new minimum wage and the log of the median farm worker wage in district j in 2012.

coverage has continued to increase from their observed post-policy levels of approximately 50 percent to our observed coverage of 60 percent. This suggests that hours worked and contract coverage may have reached a steady state in the time between the first and second minimum wage shocks. Thus, the response of these variables to the minimum wage hike may be muted, as is suggested by the stable pre- and post-policy levels for both hours and contract coverage observed in Table 4.2.

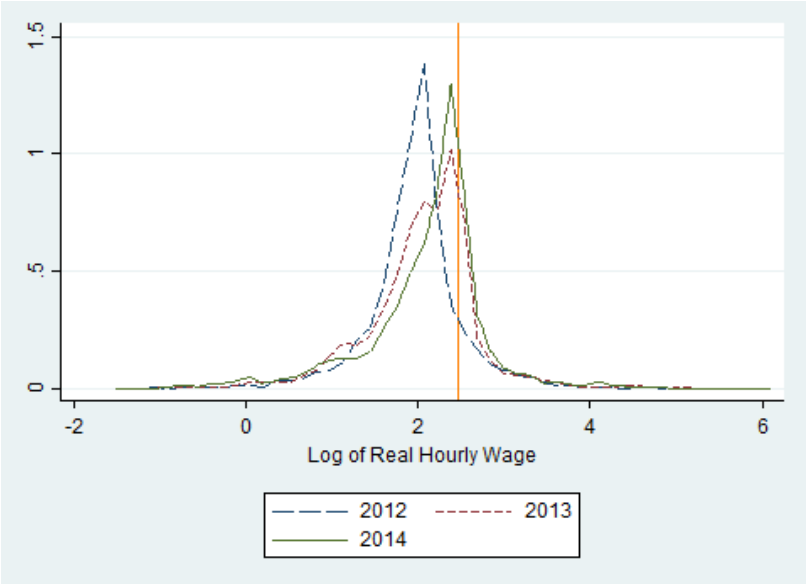
Looking at wages, we observe that over the pre-policy period farm workers had average hourly wages between R7.80 and R9.30, thus average wages were above the prevailing minimum wage of R7.71. However, as has been noted, this average wage may be driven up by overtime pay since workers were working very high hours. These pre-policy wages were between R2.90 and R5.30 lower than the control group who, as previously noted, had no minimum wage laws covering their occupations. This difference might have arisen because of various factors, including the higher education levels amongst the control group or the fact that a larger proportion of farm workers are located in rural areas, where wages generally tend to be lower (Klasen, 1997). From the table we observe that farm worker wages then tended to increase over the post-policy period, resulting in the farm worker-control group average wage gap decreasing to between R0.80 and R3.30. However, the increase in farm worker wages was not consistent or stable over the period, with average wages both increasing and decreasing quarter-to-quarter.

Figure 4.3: Mean and Median Real Hourly Wages for Farm Workers

Source: Labour Market Dynamics in South Africa (2012 - 2014b), own calculations (real values, reflected in 2013 constant prices). All estimates are weighted using sampling weights. The orange vertical line represents the closest data point to the legal implementation of the minimum wage increase, quarter two of 2013. The dashed vertical line represents the beginning of the expectations model. The green horizontal line indicates the new minimum wage, R11.66.

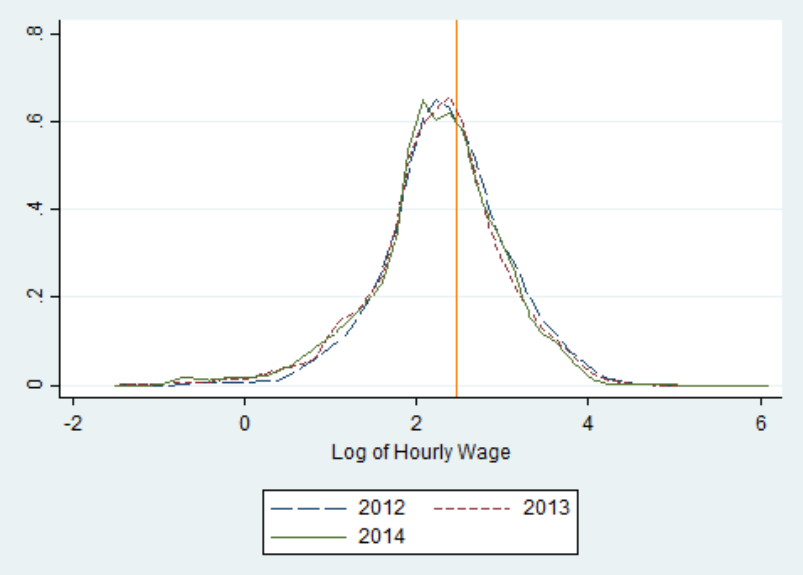
Figure 4.3 illustrates the mean and median farm worker wages over the period and shows an increasing trend in wages. The figure presents evidence that wages at the bottom end of the distribution rose faster than those at the top end because the median wage tended to increase more quickly than the mean. This suggests that the Wage Gap variable (described in Section 4.1.2) will be an important variable in our wage equation, as the lowest-earners (presumably living in high Wage Gap areas) are likely to experience larger wage increases than workers who were already earning higher wages. The figure also indicates that both mean and median wages began increasing before the minimum wage hike was legislated, where the upward trend begins in the 4^{th} quarter of 2012. This suggests that our expectations model will be significant in the wage and employment regressions. In terms of compliance, even before the policy change, the majority of wages were below the prevailing minimum wage, as indicated in Table 4.2. Wages then continued on this trend as both mean and median wages remained well below the new minimum wage of R11.66 for all of the observed post-policy periods. This indicates that minimum wage violation was a significant challenge in the sector both before and after the minimum wage hike.

Figure 4.4: Distribution of Log of Real Hourly Wages for Farm Workers



Source: Labour Market Dynamics in South Africa (2012 - 2014b), own calculations (real values, reflected in 2013 constant prices). All estimates are weighted using sampling weights. The orange vertical line represents the natural log of the new minimum wage (R11.66), which is 2.456.

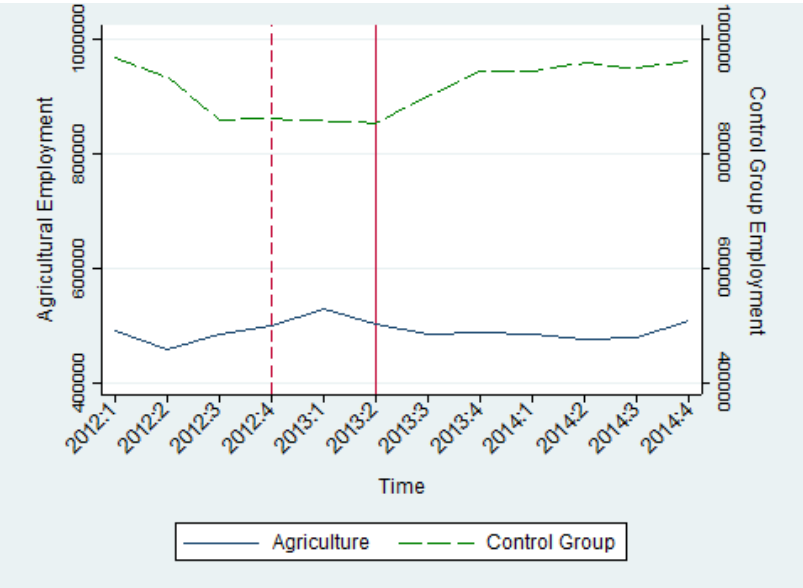
Figure 4.5: Distribution of Log of Real Hourly Wages for Control Workers



Source: Labour Market Dynamics in South Africa (2012 - 2014b), own calculations (real values, reflected in 2013 constant prices). All estimates are weighted using sampling weights. The orange vertical line represents the natural log of the new minimum wage (R11.66), which is 2.456.

For more insight into the movement of wages, Figures 4.4 and 4.5 present the kernel density plots of the log of hourly wages for the farm worker and control groups for the period from 2012 to 2014. From Figure 4.4 we see that the distribution of farm wages flattens out and moves rightward in 2013, and that in 2014 wages are also slightly more orientated towards the new minimum wage, displaying a sharp peak just below the minimum wage. Although this indicates that wages increased, it is clear that in all three years the bulk, as well as the various peaks of the distribution, remain well below R11.66, confirming our previous observation of violation in the industry. Here we also observe that the depth of the violation is severe, as in all cases the distribution has a leftward tail. Overall, it seems that wages did shift upward in response to the new minimum wage, although the issue of compliance remains. From Figure 4.5 we observe that the distribution of wages for the control group stayed almost entirely constant over the period, indicating that control group wages did not respond to the policy shift in the agricultural sector.

Figure 4.6: Quarterly Farm and Control Group Employment



Source: Labour Market Dynamics in South Africa (2012 - 2014b), own calculations. All estimates are weighted using sampling weights. The solid red vertical line represents the closest data point to the legal implementation of the minimum wage increase, quarter two of 2013. The dashed line represents the beginning of the expectations model.

Lastly, our descriptive statistics present a preliminary assessment of the employment adjustments. Of particular interest is the change in the number of workers employed in the farming industry before and after the policy change. From the weighted employment figures in Table 4.2 we see that, for our sample, the farming sector shed approximately 27 000 workers between quarter one and quarter two of 2013 (when the policy shift took place), and that this downward trend continued into the following year. Figure 4.6 reinforces this finding. From the figure we observe employment adjustments after the minimum wage policy, where agricultural employment may have began declining even in the period prior to the law. As we can see in the figure, employment was on an upward trend between the second quarter of 2012 and the first

quarter of 2013, and thus in the absence of the law employment may have continued on this trajectory or may otherwise have stabilised at a higher steady state—particularly considering that employment growth resumes later on in the period. These estimates do not account for other factors such as growth in the sector, however this assessment will be done in Section 4.3 in the regression analysis. This stark picture of the possible employment effects of the law does, however illustrate the importance of understanding the positive and negative outcomes of minimum wage laws. Particularly, we observe that minimum wage responses may be dynamic, where employers do not necessarily respond to minimum wages as a one time shock.

For the control group, Table 4.2 presents inconsistent changes in employment over the period, however a possible response is observed in Figure 4.6, where control group employment tends to increase after the minimum wage shock. This presents the possibility that workers may have moved from the farm group to the control group in response to the law. This further reinforces the importance of the Wage Gap regression specification, as this model avoids contamination from industry spill-over effects. Lastly, as we mentioned earlier, we observe no clear changes to farm workers' average weekly hours of work; this is contrary to Bhorat et al. (2014) who observe large increases in average hours—evidence that the disemployment effect of the introduction of the minimum wage was concentrated amongst part-time workers. Thus, at this stage we have no evidence of employment adjustments at the intensive margin, while we have evidence of employment losses at the extensive margin.

Overall, the descriptive statistics have revealed that farm worker's wages did increase on average, and that average hours worked and contract coverage did not change, while there is evidence of decreased employment in the agricultural sector.

4.3 Econometric Analysis

As was described in Section 4.1.2, we will now use regression analysis to isolate the impact of the minimum wage increase on various outcomes of interest. We present both specifications outlined in the methodology section, firstly the control versus treatment difference-in-differences estimation, where the control group is a group of low-skilled workers with similar demographic and earnings characteristics. Secondly, we present the Wage Gap difference-in-differences approach, where we investigate the difference in the effect of the law given the pre-law wages in the relevant district council. Both specifications will be used to estimate the effects of the minimum wage hike on farm worker income, hours of work and contract coverage, while the probability of employment will only be estimated using the Wage Gap approach (because both the farm worker and control groups are used to construct the binary dependent variable). We will also estimate each model using the three $Post_{kt}$ variables, allowing us to investigate the dynamic adjustments made in response to the minimum wage, where farmers may have expected a significant minimum wage hike.

4.3.1 Employment Effect

Table 4.4 presents the estimates for the probability of farm worker employment before and after the hike in the minimum wage, given the size of the pre-law distict Wage Gap. The binary dependent variable in this case is a one for farm workers, and a zero for all control group workers (as is described in Section 4.1.2) as

well as for unemployed individuals. This definition of the dependent variable allows workers to transition between farm worker employment, alternative employment (those jobs included in the control group), and unemployment over the period. Here we also allow for three definitions of the post-law period, $Post_{kt}$, as is described in Section 4.1.2. In this specification, the coefficients of interest are those for the interaction terms, as these tell us the effect of the law on the probability of employment in the respective post-period relative to the size of the district Wage Gap.

The coefficients on the non-interaction $Post_{kt}$ variables indicate that the probability of employment did not change significantly (statistically or economically) for areas where the pre-law district Wage Gap was zero, whether we include controls or not. This indicates that, conditional on the Wage Gap being zero (in areas where median wages were equal to the new minimum wage level prior the shock), the probability of finding employment as a farm worker did not change in response to the new minimum wage; this is likely because employers did not need to make major operational changes to comply with the new law, and thus maintained the same employment structure. The coefficients on the Wage Gap variables are positive and significant, indicating that workers had, on average, a higher probability of employment in districts with larger pre-law Wage Gaps (irrespective of the period); this is likely the effect of large farming areas that employ many farm workers and therefore generally have lower wages. Of primary interest is the coefficient on the $WageGap * Post_1$ interaction term, our difference-in-differences estimator. The negative and significant coefficient indicates that the probability of employment as a farm worker was lower in areas with larger Wage Gaps after the implementation of the minimum wage increase. The coefficient indicates that a one unit increase in the Wage Gap resulted in a 1.5 percentage point decrease in the probability of employment as a farm worker; thus districts that had higher pre-law Wage Gaps responded more sharply to the minimum wage hike by shedding jobs. This follows from the hypothesis that areas with larger Wage Gaps will reducing employment more sharply, because they would need to make bigger operational adjustments in order to pay wages that comply with (or are at least closer to) the new minimum wage.

Besides the impact of the legislated minimum wage increase, we note from Table 4.4 the significance of the $WG * Post_2$ and $WG * Post_3$ interaction term coefficients. These indicate that employers, besides responding to the minimum wage at the actual time of the law, also made employment adjustments in expectation of the law, confirming the findings from the descriptive statistics—specifically, the premature decline in employment illustrated in Figure 4.6. This indicates that farmers decreased employment up to six months before the new minimum wage was legally implemented.

Table 4.4: Probability of Employment as a Farm Worker

Variables	(1)	(2)	(3)	(4)
$Post_1$	-0.00154	0.000754		
	(0.00176)	(0.00183)		
WG	0.0672***	0.0505***	0.0512***	0.0490***
	(0.00218)	(0.00226)	(0.00228)	(0.00264)
WG*$Post_1$	-0.0122***	-0.0150***		
	(0.00296)	(0.00303)		
$Post_2$			0.00269	
			(0.00179)	
WG*$Post_2$			-0.0142***	
			(0.00299)	
$Post_3$				0.00155
				(0.00208)
WG*$Post_3$				-0.00982***
				(0.00318)
Controls	No	Yes	Yes	Yes
Constant	0.0608***	0.294***	0.293***	0.293***
	(0.00132)	(0.00735)	(0.00734)	(0.00751)
Observations	109,807	109,356	109,356	109,356
R-squared	0.014	0.097	0.097	0.097

Source: Labour Market Dynamics in South Africa (2012 - 2014b); own calculations.
Notes: The significance asterisks denote ***p<0.001, **p<0.01 and *p<0.05. All regressions are weighted and standard errors (robust for heteroskedasticity) are presented in brackets. The dependent variable is whether the worker is employed as a farm worker or not (either unemployed or control group worker). Controls are included for age, highest level of education, race, gender, district council, as well as quarterly dummies to control for seasonality and provincial agricultural value added. The post periods are binary variables defined as follows: $Post_1$=1 for all periods from April 2013, $Post_2$=1 for all periods from January 2013 and $Post_3$=1 for all periods from October 2012. WG denotes the Wage Gap variable which is the difference between the log of the new minimum wage and the log of the median farm worker wage in district j in 2012. The Linear Probability Model is presented here for ease of interpretation, however Probit and Logit estimates were also run and present similar findings in terms of coefficient signs and significance.

For a sense of the extent of these changes in the probability of employment over the period, we illustrate the change in the conditional probability. We consider the probability of employment for a 35 year old, African, male worker, with 9 years of education, and who is working in an area with the average Wage Gap (0.375, which is equal to a pre-law median wage of R8.01 per hour). Prior to the minimum wage hike, this worker would have had a 10.71 conditional probability of employment as a farm worker, according to the presented coefficients. Our estimates then tell us that this worker would have had a 10.22 conditional probability of farm employment after the 1^{st} of April 2013, when the new minimum wage law was in place. This equates to a 5 percent decrease in this worker's probability of being employed as a farm worker. When we consider the farmer expectation model, we see that the conditional probability of employment as a farm worker decreased by 2.5 percent when farmers are allowed to expect the shock one quarter before it occurred, and decreased by 2 percent when farmers are allowed to expect the shock two quarters before it occurred.

We previously noted that areas with lower pre-law wages experienced larger employment declines as a result of the shock. To illustrate this, we again estimate the conditional probability of employment before and after the minimum wage hike, but in this case we increase the Wage Gap from the average Wage Gap of 0.375 by one unit to 1.375. In this case, the same worker would have had a 15.75 conditional probability of employment as a farm worker before the minimum wage hike occurred, and a 13.77 conditional probability of farm employment after the hike. This equates to a 12.8 percent decline in his probability of employment as a farm worker resulting from the change in the law. This conditional probability decline is almost three times larger than when the worker was assumed to be in a lower Wage Gap area.

4.3.2 Wage Effect

We now consider the extent to which wages responded to the minimum wage shock. Table 4.5 presents the treatment versus control regression results when the natural log of the real hourly wage is the dependent variable. From columns (1) and (2) we observe that in the $Post_1$ period, after the legislated wage hike, control group workers earned significantly less than in the pre-policy period. The farm worker coefficients in all specifications indicate that farm workers earned significantly less than control group workers (between 24 and 35 percent less) in the pre-policy period, confirming this finding from the summary statistics. The difference-in-differences interaction coefficients in columns (1) and (2) indicate the change in farm worker wages in the post-policy period, with and without controls. Here we observe that farm workers' wages increased significantly in response to the law—farm worker wages were between 18 and 21 percent higher after the legislated minimum wage increase than they were before it.

The coefficients in columns (3) and (4) indicate that employers did expect the minimum wage hike, and made adjustments accordingly. The $Post_2$ interaction term indicates that farm wages began increasing one quarter before the law was enacted, with wage increases of approximately 18 percent. $FarmWorker{*}Post_3$ indicates that farm wages increased by 16 percent two quarters before the legislated minimum wage increase. This suggests that farmers adjusted wages in response to the strike activity and protests, before it was legally mandated for them to do so.

Table 4.5: Log of Real Hourly Wages, Farm Worker versus Control Group Approach

Variables	(1)	(2)	(3)	(4)
$Post_1$	-0.0821***	-0.0644***		
	(0.0145)	(0.0143)		
Farm Worker	-0.352***	-0.240***	-0.258***	-0.258***
	(0.0161)	(0.0165)	(0.0168)	(0.0193)
Farm Worker*$Post_1$	0.208***	0.179***		
	(0.0228)	(0.0217)		
$Post_2$			-0.0806***	
			(0.0142)	
Farm Worker*$Post_2$			0.182***	
			(0.0216)	
$Post_3$				-0.0854***
				(0.0157)
Farm Worker*$Post_3$				0.162***
				(0.0228)
Controls	No	Yes	Yes	Yes
Constant	2.325***	1.620***	1.636***	1.651***
	(0.0104)	(0.0391)	(0.0390)	(0.0408)
Observations	24,876	24,745	24,745	24,745
R-squared	0.028	0.092	0.092	0.091

Source: Labour Market Dynamics in South Africa (2012 - 2014b); own calculations.
Notes: The significance asterisks denote ***p<0.001, **p<0.01 and *p<0.05. All regressions are weighted and standard errors (robust for heteroskedasticity) are presented in brackets. The dependent variable is the natural log of hourly wages and the sample includes control and farm workers. Controls are included for age, highest level of education, race, gender, district council, as well as quarterly dummies to control for seasonality and provincial agricultural value added. The post periods are binary variables defined as follows: $Post_1$=1 for all periods from April 2013, $Post_2$=1 for all periods from January 2013 and $Post_3$=1 for all periods from October 2012.

Another estimate of the wage effect is presented in Table 4.6, where we employ the Wage Gap approach. From these estimates we observe the impact of the minimum wage law on farm worker wages, however we do not rely on the construction of a control group, as was the case in the previous specification. Firstly, the coefficients on the $Post_{kt}$ variables inform us about wages in areas where there is a zero Wage Gap. From the coefficients in columns (1) and (2) we observe that wages did not change significantly in district councils where median wages were equal to the new minimum wage. This is expected since many employers in these districts were already paying wages that would represent compliance in the post-policy period ($Post_1$), so few changes were required in these areas. The coefficients on the Wage Gap variables (WG) indicate the relationship between large pre-law district Wage Gaps and hourly wages, irrespective of the period. These coefficients indicate that wages tended to be lower in areas with larger pre-law Wage Gaps, whether in the pre- or post-policy period. This most likely indicates large farming districts with large numbers of farm workers, where wages are driven down by an over-supply of labour, and where it might also be more difficult for labour inspectors to reach, resulting in low levels of compliance. The coefficients of interest—the difference-

in-differences interaction terms—indicate the change in wages in areas with large pre-law Wage Gaps. These positive coefficients indicate that wages increased significantly in areas with larger pre-law Wage Gaps. Thus, employees who were in areas that paid lower wages before the minimum wage hike experienced significant increases in their wages as a result of the law change. This suggests that the law was successful in impacting the wages of the most vulnerable farm workers.

Table 4.6: Log of Real Hourly Wages, Wage Gap Approach

Variables	(1)	(2)	(3)	(4)
$Post_1$	0.00802	0.0105		
	(0.0519)	(0.0522)		
WG	-0.957***	-0.809***	-0.692***	-0.681***
	(0.0774)	(0.0856)	(0.0753)	(0.0891)
WG*$Post_1$	0.221**	0.198**		
	(0.0984)	(0.0991)		
$Post_2$			0.0814*	
			(0.0486)	
WG*$Post_2$			0.0181	
			(0.0913)	
$Post_3$				0.0655
				(0.0549)
WG*$Post_3$				-0.000832
				(0.101)
Controls	No	Yes	Yes	Yes
Constant	2.434***	2.100***	2.043***	2.032***
	(0.0411)	(0.0656)	(0.0636)	(0.0710)
Observations	9,237	9,106	9,106	9,106
R-squared	0.135	0.180	0.177	0.174

Source: Labour Market Dynamics in South Africa (2012 - 2014b); own calculations.
Notes: The significance asterisks denote ***p<0.001, **p<0.01 and *p<0.05. All regressions are weighted and standard errors (robust for heteroskedasticity) are presented in brackets. The dependent variable is the natural log of hourly wages and the sample includes farm workers. Controls are included for age, highest level of education, race, gender, district council, as well as quarterly dummies to control for seasonality and provincial agricultural value added. The post periods are binary variables defined as follows: $Post_1$=1 for all periods from April 2013, $Post_2$=1 for all periods from January 2013 and $Post_3$=1 for all periods from October 2012. WG denotes the Wage Gap variable which is the difference between the log of the new minimum wage and the log of the median farm worker wage in district j in 2012.

From the table we also observe that the size of the district Wage Gap did not distinctly impact the way farmers adjusted wages in expectation of the new law. While the $WG * Post_1$ interaction terms were significant, indicating that employers in large Wage Gap areas adjusted wages at the time of the minimum wage hike, the $Post_2$, $Post_3$, $WG * Post_2$ and $WG * Post_3$ coefficients were generally insignificant. Together this indicates that farmers in high Wage Gap areas increased wages at the time of the law change, but also that neither employers in zero, nor large Wage Gap areas, made wage adjustments in the period before the

new minimum wage was mandated.

4.3.3 Effect on Hours Worked

Besides the effect of the law on the probability of employment as a farm worker and wages paid to farmer workers, we are also interested in how farmers might have changed the number of hours of work they demanded from their workers—which might represent employment effects at the intensive margin. For example, as has been noted, Bhorat et al. (2014:1417) find that while the probability of employment as a farm worker decreased as a result of the initial agricultural minimum wage, the hours of work simultaneously increased, indicating that disproportionately more part-time farm workers lost their jobs, driving average weekly hours worked up. This increase in average hours was also observed in their descriptive statistics. Tables 4.7 and 4.8 present the estimates for the impact of the 2013 minimum wage shock on usual weekly hours worked using the treatment versus control and Wage Gap approaches, respectively.

From the $Post_1$ coefficients in columns (1) and (2) of Table 4.7, we observe that, on average, in the post-policy period control group workers worked approximately 2 hours less than before. From the $FarmWorker$ coefficients we also see that farm workers worked on average approximately 5-6 hours more than control group workers, irrespective of the period. These trends were also indicated in the summary statistics where we observed that the control group worked fewer hours than farm workers, and that control group workers' hours decreased over time. From the interaction terms we observe findings consistent with Bhorat et al. (2014), where farm worker hours increased by between 1.4 and 1.6 hours per week in response to the minimum wage hike.

Columns (3) and (4) present the expectations model findings and these also indicate that farm workers worked more hours than their control group counterparts. From the $WG*Post_2$ and $WG*Post_3$ interaction terms we observe that the increasing trend in farm workers' hours relative to control group hours began in the two quarters before the minimum wage was actually implemented. Together with the $WG * Post_1$ findings, this suggests that farmers either increased the number of hours demanded of the remaining farm workers, or as is suggested by Bhorat et al. (2014), that the disemployment effect observed in Table 4.4 was concentrated amongst part-time workers, and that these effects began in the period before the minimum wage hike was implemented. This suggests that farmers were attempting to compensate for the lost productivity of the smaller work force, either through retaining their relatively more productive full-time workers, or by increasing the number of hours worked by the remaining employees—both as the law was implemented and in expectation of it.

Table 4.7: Usual Weekly Hours of Work, Farm Worker versus Control Group Approach

Variables	(1)	(2)	(3)	(4)
$Post_1$	-2.101***	-1.846***		
	(0.235)	(0.232)		
Farm Worker	5.325***	6.206***	6.055***	6.012***
	(0.238)	(0.250)	(0.276)	(0.315)
Farm Worker*$Post_1$	1.629***	1.408***		
	(0.320)	(0.321)		
$Post_2$			-1.831***	
			(0.236)	
Farm Worker*$Post_2$			1.469***	
			(0.332)	
$Post_3$				-1.882***
				(0.263)
Farm Worker*$Post_3$				1.378***
				(0.360)
Controls	No	Yes	Yes	Yes
Constant	41.20***	43.49***	43.54***	44.04***
	(0.174)	(0.581)	(0.584)	(0.608)
Observations	24,876	24,745	24,745	24,745
R-squared	0.069	0.104	0.103	0.103

Source: Labour Market Dynamics in South Africa (2012 - 2014b); own calculations.
Notes: The significance asterisks denote ***p<0.001, **p<0.01 and *p<0.05. All regressions are weighted and standard errors (robust for heteroskedasticity) are presented in brackets. The dependent variable is the usual number of hours worked per week and the sample includes control and farm workers. Controls are included for age, highest level of education, race, gender, district council, as well as quarterly dummies to control for seasonality and provincial agricultural value added. The post periods are binary variables defined as follows: $Post_1$=1 for all periods from April 2013, $Post_2$=1 for all periods from January 2013 and $Post_3$=1 for all periods from October 2012.

Table 4.8 also presents estimates for the change in hours worked, however it uses the Wage Gap approach. From the table we observe very little significance of our estimates, except in the case of the WG coefficients, which indicate that irrespective of the period, workers in high Wage Gap areas worked longer weekly hours than those in smaller Wage Gap areas. This reinforces our finding from Table 4.3 in the descriptive statistics where we observed higher average hours worked for higher Wage Gap categories. This also confirms our earlier observation that large Wage Gap areas are those that are higher productivity farming areas, that employ more farm workers and possibly have poorer conditions and higher working hours. The $Post_{kt}$ coefficients all suggest that hours had increased in the post-policy periods for zero Wage Gap areas, irrespective of the definition of the $Post_{kt}$ variable, however none of these coefficients are significant. The interaction terms in all four specifications are insignificant. This suggests that when these farms in large Wage Gap areas decreased employment (as we saw in Table 4.4), they did not bias their firing towards either part-time or full-time workers. Thus, the retention of high productivity workers or the firing of part-time workers was not a result consistent across the specifications.

Table 4.8: Usual Weekly Hours of Work, Wage Gap Approach

Variables	(1)	(2)	(3)	(4)
$Post_1$	0.572	0.564		
	(0.737)	(0.677)		
WG	4.181***	3.392***	3.994**	3.827**
	(1.193)	(1.146)	(1.559)	(1.833)
WG*$Post_1$	-2.101	-2.054		
	(1.500)	(1.373)		
$Post_2$			0.892	
			(0.813)	
WG*$Post_2$			-2.551	
			(1.671)	
$Post_3$				0.514
				(0.935)
WG*$Post_3$				-2.176
				(1.920)
Controls	No	Yes	Yes	Yes
Constant	44.52***	46.99***	46.66***	47.09***
	(0.580)	(0.916)	(1.055)	(1.166)
Observations	9,237	9,106	9,106	9,106
R-squared	0.009	0.045	0.045	0.045

Source: Labour Market Dynamics in South Africa (2012 - 2014b); own calculations.

Notes: The significance asterisks denote ***p<0.001, **p<0.01 and *p<0.05. All regressions are weighted and standard errors (robust for heteroskedasticity) are presented in brackets. The dependent variable is the usual number of hours worked per week and the sample includes farm workers. Controls are included for age, highest level of education, race, gender, district council, as well as quarterly dummies to control for seasonality and provincial agricultural value added. The post periods are binary variables defined as follows: $Post_1$=1 for all periods from April 2013, $Post_2$=1 for all periods from January 2013 and $Post_3$=1 for all periods from October 2012. WG denotes the Wage Gap variable which is the difference between the log of the new minimum wage and the log of the median farm worker wage in district j in 2012.

Overall, Tables 4.7 and 4.8 indicate that hours worked increased on average for farm workers relative to control group workers both in the post-policy period and in expectation of the minimum wage increase (thus the sector either employed fewer part-time workers overall, or increased the hours demanded of the remaining workers), while this effect was not necessarily sharper in areas with larger Wage Gaps. The general lack of significance of the Wage Gap estimates suggests that the response in terms of hours worked was not influenced by pre-law district wages.

It is important to interpret the hours worked findings in the context of already high weekly hours for farm workers. In particular, Bhorat et al. (2014:1408) indicate that hours worked increased noticeably in the period that they study, where an average of 35 hours were worked per week in 2000, whereas this number increased to 47 by 2007. In our case, the descriptive statistics indicated that average hours worked was stable at ap-

proximately 46 for the entire period between 2012 and 2014. Besides this, the Sectoral Determination limits the usual hours worked per week to 45 hours (Department of Labour, 2006:11), thus the scope to increase hours worked was already limited for farmers. For this reason our findings likely indicate a disproportionate decrease in the number of part-time workers employed, as opposed to an increase in the number of hours that existing workers worked per week.

4.3.4 Contract Coverage Effect

Finally, given that Sectoral Determination 13 lays out employment condition requirements besides the minimum wage, we consider the impact of the revised Sectoral Determination on contract coverage in the sector. Although the 2013 Sectoral Determination did not lay out new contract requirements, it is possible that the drastic new legislation may have prompted farmers to consider more carefully the requirements of the minimum wage law, resulting in a change in the probability that farm workers have a written employment agreement. It is also possible that the disemployment effects were focused among workers who had no contracts, as these workers may be easier to fire, causing an increase in coverage within the sector. Tables 4.9 and 4.10 present the results of our analysis of the effect of the minimum wage on the probability that farm workers are covered by a written contract.

From Table 4.9 we observe the farm worker versus control difference-in-differences estimates. From the $Post_{kt}$ coefficients we observe that in the post-period all workers had a higher probability of having a written employment contract on average, both for $Post_1$, as well as for the two quarters prior to the policy change. From the farm worker coefficients we observe that farm workers tended to have a higher probability of holding a written contract than their control group counterparts, which is contrary to the findings of Bhorat et al. (2014). The difference-in-differences coefficients, although suggesting a decrease in the probability of farm workers having a written contract in the post-policy period, are generally not statistically significant. Thus there was on average no change in farm worker contract coverage relative to control worker contract coverage in the post-policy period. This is consistent for both the standard post-policy period, as well as in the expectations specifications.

Table 4.9: Contract Coverage, Farm Worker versus Control Group Approach

Variables	(1)	(2)	(3)	(4)
$Post_1$	0.0502***	0.0512***		
	(0.00957)	(0.00946)		
Farm Worker	0.0350***	0.0581***	0.0423***	0.0397**
	(0.0119)	(0.0120)	(0.0135)	(0.0155)
Farm Worker*$Post_1$	-0.0293*	-0.0296*		
	(0.0155)	(0.0153)		
$Post_2$			0.0360***	
			(0.00964)	
Farm Worker*$Post_2$			-0.00280	
			(0.0160)	
$Post_3$				0.0325***
				(0.0108)
Farm Worker*$Post_3$				0.000525
				(0.0175)
Controls	No	Yes	Yes	Yes
Constant	0.611***	0.224***	0.233***	0.226***
	(0.00734)	(0.0247)	(0.0249)	(0.0260)
Observations	24,805	24,674	24,674	24,674
R-squared	0.002	0.082	0.081	0.081

Source: Labour Market Dynamics in South Africa (2012 - 2014b); own calculations.
Notes: The significance asterisks denote ***p<0.001, **p<0.01 and *p<0.05. All regressions are weighted and standard errors (robust for heteroskedasticity) are presented in brackets. The dependent variable is whether the worker had a written contract or not and the sample includes control and farm workers. Controls are included for age, highest level of education, race, gender, district council, as well as quarterly dummies to control for seasonality and provincial agricultural value added. The post periods are binary variables defined as follows: $Post_1$=1 for all periods from April 2013, $Post_2$=1 for all periods from January 2013 and $Post_3$=1 for all periods from October 2012.

In Table 4.10 we present the Wage Gap results for contract coverage. The $Post_{kt}$ results indicate that workers in areas with zero district Wage Gaps had no significant change in farm worker contract coverage as a result of the Sectoral Determination revision. The WG coefficients indicate that, in general, there was significantly lower contract coverage in areas with larger Wage Gaps. Again, this is likely an illustration of larger farming areas that employ a large number of farm workers, where workers generally have poorer working conditions and thus fewer workers have a written employment contract. From the $WG * Post_1$ interaction terms we observe that contract coverage may have increased more in these large Wage Gap areas, which supports the notion that large Wage Gap areas initially had low contract coverage and thus responded by increasing contract coverage more sharply than low Wage Gap areas, although these coefficients are only slightly significant. The $WG * Post_2$ and $WG * Post_3$ coefficients are statistically insignificant, although their positive signs suggest that farmers increased contract coverage marginally in expectation of the updated Sectoral Determination. The generally muted contract coverage effects observed in Tables 4.9 and 4.10 may be due to the fact that contract coverage has already increased substantially in the agricultural sector. For example, Bhorat et al. (2014:1408) initially find farm worker contract coverage rates of approximately only

30 percent in 2000, and then 52 percent by 2007. In our summary statistics we find that approximately 65 percent of farm workers were covered by a contract in 2012, prior to the policy change. Therefore, the majority of workers already had a contract before the Sectoral Determination revision, which may have limited the extent to which contract coverage could increase, especially in an industry where a large proportion of workers work in a seasonal capacity.

Table 4.10: Contract Coverage, Wage Gap Approach

Variables	(1)	(2)	(3)	(4)
$Post_1$	-0.0393	-0.0333		
	(0.0319)	(0.0274)		
WG	-0.419***	-0.310***	-0.331***	-0.289***
	(0.0530)	(0.0466)	(0.0623)	(0.0716)
WG*$Post_1$	0.117*	0.0922*		
	(0.0604)	(0.0514)		
$Post_2$			-0.0239	
			(0.0339)	
WG*$Post_2$			0.107*	
			(0.0644)	
$Post_3$				0.00721
				(0.0388)
WG*$Post_3$				0.0482
				(0.0730)
Controls	No	Yes	Yes	Yes
Constant	0.848***	0.568***	0.566***	0.532***
	(0.0283)	(0.0458)	(0.0507)	(0.0554)
Observations	9,166	9,035	9,035	9,035
R-squared	0.039	0.080	0.081	0.081

Source: Labour Market Dynamics in South Africa (2012 - 2014b); own calculations.
Notes: The significance asterisks denote ***p<0.001, **p<0.01 and *p<0.05. All regressions are weighted and standard errors (robust for heteroskedasticity) are presented in brackets. The dependent variable is whether the worker had a written contract or not and the sample includes farm workers. Controls are included for age, highest level of education, race, gender, district council, as well as quarterly dummies to control for seasonality and provincial agricultural value added. The post periods are binary variables defined as follows: $Post_1$=1 for all periods from April 2013, $Post_2$=1 for all periods from January 2013 and $Post_3$=1 for all periods from October 2012. WG denotes the Wage Gap variable which is the difference between the log of the new minimum wage and the log of the median farm worker wage in district j in 2012.

Overall, the econometric results show that employment declined in response to the minimum wage hike, with more acute disemployment effects in areas with larger district Wage Gaps. The evidence also indicates that this disemployment effect was concentrated among part-time workers, as average weekly hours worked increased overall, although this was not the case in areas with larger Wage Gaps. The expectations model indicates that these employment adjustments, both at the extensive and intensive margins, began to take place in the two quarters prior to the implementation of the minimum wage hike, suggesting that farmers

started making labour force adjustments in anticipation of the policy review. The findings indicate significant increases in wages in response to the revised Sectoral Determination, with wage increases of between 18 and 20 percent. These wage increases were also more acute in areas with large Wage Gaps. The expectations model also reveals that wages increased relative to the control group in the two quarters prior to the legislated minimum wage adjustment. Lastly, there were no significant changes to contract coverage in response to the law, and this was likely the result of relatively high contract coverage in the industry before the shock occurred.

Later, in chapter 5, we will present a summary table of the results of the employment, wage, hours and contract effects for both the first and second minimum wage shocks, using the results from Bhorat et al. (2014) as well as our econometric analysis. This will allow us to summarise and compare how the agricultural labour market adjusted to the two minimum wage shocks, thus assessing the comparative response of employers when faced with a second minimum wage shock.

4.4 Violation Estimates

It has been pointed out by previous research, for example Ashenfelter and Smith (1979), that compliance is an important factor for the effectiveness of a minimum wage policy. In this section we will estimate and discuss violation of the farm worker's minimum wage.

South Africa's Inspection and Enforcement Services are tasked with enforcing Department of Labour policies including minimum wages, and does so with the use of various monitoring and evaluation programmes (Department of Labour, 2014). A major form of the evaluation of minimum wages is site inspections. Because farms are often located remotely and are difficult to reach, by nature the industry presents major challenges for site inspections. Thus, inspectors often cannot reach many farms for evaluation, which creates a barrier to enforcement. According to Helliker (2013), the quality of inspections is also questionable. The author quotes an Eastern Cape farm worker recalling an inspector who, during an inspection, only had discussions with the farm owner (failing to speak with workers), and later returned to the farm with a pickup truck to collect a sheep. This suggests some degree of bribery amongst farmers and inspectors. These barriers to inspection, and thus minimum wage enforcement, create larger than usual potential for minimum wage violation in the farming sector.

Various estimates from our analysis highlighted that violation occurred despite significant increases in average wages, for example a large proportion of workers earned wages that were below the minimum level in the post-policy period. For this reason, we now take a brief look at violation estimates for the sector over the period of interest, and investigate how absolute violation and the depth of violation were impacted by the minimum wage hike. Table 4.11 presents the aggregate violation index estimates, as described in Section 4.1.2. We draw from the findings of Bhorat, Kanbur and Mayet (2013b) for the violation index estimates for 2007, which provides a point of reference for our more recent estimates.

As we mentioned earlier, V_0 indicates the proportion of workers earning below the minimum wage, V_1 indicates the average gap between wages and the minimum wage as a proportion of the minimum wage, and V_2 squares this gap, providing a measure of violation which is more sensitive to larger gaps (Bhorat, Kanbur

Table 4.11: Agricultural Minimum Wage Violation Index Estimates

	2007	**2012**	**2013**	**2014**
V_0	0.55	0.65	0.76	0.77
	[0.513 : 0.590]	[0.647 : 0.680]	[0.749 : 0.779]	[0.775 : 0.804]
V_1	0.16	0.12	0.16	0.17
	[0.148 : 0.182]	[0.115 : 0.128]	[0.160 : 0.175]	[0.163 : 0.179]
V_2	0.07	0.05	0.07	0.09
	[0.063 : 0.084]	[0.043 : 0.054]	[0.066 : 0.078]	[0.074 : 0.088]
V_1/V_0	0.30	0.18	0.22	0.23
	[0.275 : 0.323]	[0.174 : 0.192]	[0.211 : 0.228]	[0.208 : 0.226]

Source: Bhorat, Kanbur and Mayet (2013b:194) for 2007; Labour Market Dynamics in South Africa for 2012-2014, own calculations. All estimates are weighted using sampling weights. Below each index the 95 percent confidence interval is presented in brackets.

and Mayet, 2013b:193). V_1/V_0 allows us to interpret V_1, denoting how much violated workers are on average earning below the minimum wage (the average percentage shortfall of the wages of violated workers from the minimum wage (Bhorat, Kanbur and Mayet, 2013b:194)).

From the outset we observe that there was a high incidence of violation in 2007, where more than half of farm workers were earning below the minimum wage. From the V_1/V_0 estimate for 2007 we observe that the depth of violation was also significant, where on average, violated workers were earning 30 percent below the minimum wage. From the more recent estimates we observe that the proportion of workers earning below the minimum wage increased after 2007, and then further increased between 2012 and 2014 to 77 percent. We observe from V_1/V_0 and V_2 that the depth of violation decreased between 2007 and 2012, indicating that the gap between the minimum wage and the average wages of violated workers steadily declined over the period. However, the depth of violation then increased between 2012 and 2013. Specifically, V_1/V_0 suggests that in 2012 (prior to the minimum wage hike), the average shortfall of the wages of violated farm workers was 18 percent, while this shortfall rose to 22 percent in the following year. Figure 4.7 disaggregates these estimates to the quarterly time periods and reflects the violation trends over the period.

From the figure we observe a large increase in the proportion of violated farm workers, reflected in V_0, at the time that the minimum wage hike was implemented. This suggests that some workers who were previously earning wages close to, but above minimum wage levels did not experience wage increases that were large enough to maintain compliance—in other words, a group of farm workers whose wages just complied in the pre-policy period, did not experience wage increases large enough to maintain compliance with the new minimum wage, even if wage increases did occur. Thus, the proportion of violated workers increased at the time of the minimum wage hike, as this group moved from compliance to non-compliance. The proportion of violated workers slowly decreased in the period after the minimum wage hike, indicating that some farmers began complying with the law late, however V_0 remains significantly high at well over 60 percent for the period. V_1, V_2 and V_1/V_0 remain relatively flat over the period, with only marginal increases. This indicates that the depth of violation stayed relatively constant, and that wages at the bottom end of the distribution rose, but not by enough to reduce the average gap between the minimum wage and actual wages.

Thus, combing our evidence we find that along with the overall decline in employment, the wages of the

Figure 4.7: Estimated Agricultural Violation Indexes

Source: Labour Market Dynamics in South Africa (2012 - 2014b); own calculations. All estimates are weighted using sampling weights. The red vertical line represents the closest period in the data to the legal implementation of the agricultural minimum wage increase, quarter two of 2013.

remaining farm workers did not rise fast enough to match the increase in the minimum wage, thus the overall proportion of workers earning below the minimum wage rose. Besides this, the wages of the lowest paid farm workers did not increase enough to reduce the depth of violation. However, the wage findings from the regression results indicate that wages in the lowest paying areas did increase more, suggesting overall that the law was successful in the sense that it did have the largest effect on the poorest workers.

Chapter 5

Comparison of the First and Second Minimum Wage Shock Effects

As we have already suggested in Section 4.3, the introduction of the minimum wage and the minimum wage hike had varying effects on the labour market. In this section we compare the effects of the first and second minimum wage shocks more carefully, presenting an analysis of how employers responded comparatively to the initial minimum wage and to the significant minimum wage hike ten years later. We are particularly interested in the extent to which employment adjusted at the intensive and extensive margins in each case, and how wages and contract coverage adjusted comparatively. Table 5.1 compares the estimated difference-in-differences interaction coefficients for employment, wages, contract coverage and hours worked from both Bhorat et al. (2014) as well as from our estimates in Section 4.3.

In terms of employment, both shocks had negative employment effects, however the introduction of the minimum wage had a stronger effect on employment than the 2013 minimum wage hike.

For the first minimum wage shock the findings suggest that farmers responded to the minimum wage by adjusting employment at both the intensive and extensive margins; average employment decreased overall, representing the adjustment at the extensive margin, and hours of work also responded significantly, representing the response at the intensive margin. The first minimum wage shock resulted in an increase in average hours worked, indicating that employment losses were concentrated amongst part-time (low hours) workers, thus overall hours of work increased after the introduction of the minimum wage. This was observed both in the descriptive and regression findings of Bhorat et al. (2014). For the second minimum wage shock we also observe adjustments at the extensive margin with declining employment, although the decline in employment was smaller than that of the first minimum wage shock. In terms of adjustments at the intensive margin, the findings for the second shock were not as strong as Bhorat et al. (2014). From the descriptive statistics we find no observable change in the average hours worked or in the distribution of hours worked by farm workers. However, the regression results indicate that hours increased marginally for farm workers relative to their control group counterparts on average, suggesting that farmers fired slightly more part-time workers overall. The increase in agricultural hours relative to the control group of 1.4 hours per week was

Table 5.1: Comparison of the Effects of the First (2003) and Second (2013) Agricultural Minimum Wage Shocks, Difference-in-Differences Estimators

Dependent Variable	Minimum Wage Shock	Farm Worker/ Control	Farm Worker/ Control Ratio	Wage Gap	Wage Gap Ratio
Employment	First	-	-	-0.056***	0.27
	Second	-		-0.015***	
Log of Wages	First	0.224***	0.80	0.121***	1.64
	Second	0.179***		0.198**	
Hours of Work	First	5.549***	0.25	9.058***	-0.23
	Second	1.408***		-2.054	
Contract Coverage	First	0.076***	-0.39	0.088**	1.05
	Second	-0.03*		0.092*	

Source: Bhorat et al. (2014) and own calculations, estimates from Tables 4.4, 4.5, 4.6, 4.7, 4.8, 4.9 and 4.10. The significance asterisks denote ***p<0.001, **p<0.01 and *p<0.05. The quoted estimates represent the difference-in-differences interaction terms from the farm worker versus control and Wage Gap approaches. Thus, the farm worker versus control coefficients can be interpreted as the change in the dependent variable for farm workers in the post-period relative to control group workers. The Wage Gap coefficients can be interpreted as the change in the dependent variable given a one unit increase in the Wage Gap (the difference between the log of the new minimum wage and the log of the median farm worker wage in district j the year before the policy was implemented). The specifications are described in Section 4.1.2. Ratios reflect the coefficient for the second shock divided by the coefficient for the first shock.

much smaller than the increase of 5.5 hours per week that Bhorat et al. (2014) find for the first shock. This is likely the case because by the time the second minimum wage shock occurred, the majority of part-time agricultural jobs had already been shed, where the descriptive statistics indicated that there were very few part-time workers in the industry.

Despite the treatment versus control specification identifying an overall increase in farm worker hours, the Wage Gap approach indicated that this was not necessarily the case for workers in large Wage Gap areas, as these estimates were insignificant. This is likely the case because workers in high Wage Gap areas were already working very long hours, where Table 4.3 revealed that some high Wage Gap areas had average hours as high as 50 hours per week (which is 5 hours longer than the maximum prescribed by the Sectoral Determination). This suggests that there were very few part-time workers in high Wage Gap areas to begin with, and thus job shedding in these areas could not be concentrated amongst part-time workers.

Overall, the evidence suggests that the 2003 minimum wage shock started a decreasing trend in the number of part-time workers in the industry. Thus, the second shock came at a time when most of the part-time jobs had already been shed, and hence we witness a move to shed jobs amongst mainly full-time workers. We can possibly interpret this second adjustment as a story of culling 'deeper' and retrenching relatively more full-time workers than part-time workers.

In terms of wages, both minimum wage shocks resulted in significant wage increases for farm workers. Both Bhorat et al. (2014) and our assessment find evidence of increasing wages from the descriptive statistics, where the wage distributions moved upwards towards the respective minimum wage. From the regression results both papers find significant wage increases, where wages increased by approximately 22 percent

after the first shock, and approximately 18 percent after the second shock. Thus, as with employment, the overall wage effect was stronger for the first shock than for the second shock. From the ratios of the second interaction coefficient to the first, we observe that, while the minimum wage introduction had a larger overall wage effect than the second shock, the second shock had a greater impact on wages in areas with very low pre-law wages. This is reflected in the greater than one ratio (1.64) for the Wage Gap coefficients. This indicates that, in terms of wages, farmers in large Wage Gap areas were more sensitive to the minimum wage hike in 2013 than to the minimum wage introduction. This could suggest that the protest action of 2012 was concentrated in large Wage Gap areas (where workers were most desperate for a wage increase), and thus had the largest effect on employers in these areas.

Lastly, both papers assessed contract coverage, investigating whether more farm workers obtained a contract after each of the minimum wage shocks. Bhorat et al. (2014) found that farm worker contract coverage responded significantly to the written contract requirement of the Sectoral Determination, where even in the descriptive statistics the authors found that almost 50 percent of farm workers held a written contract after 2003, while the minority held contracts in the pre-minimum wage period. This result was then confirmed by their econometric analysis, where the probability that farm workers had a written contract increased by approximately 8 percent after the minimum wage was introduced. Like hours of work, this increase in contract coverage following the first minimum wage shock was evident in the analysis of the 2013 minimum wage hike, where the descriptive statistics indicated that farm workers had maintained a relatively high proportion of contract coverage; at the beginning of 2012 over 60 percent of farm workers had a written contract. Because of this high pre-policy proportion of contract coverage, the regression analysis generally produced insignificant contract effects for the second shock. Thus this suggests that by the time the second shock had occurred, enough workers had obtained a contract for the 2013 adjustment of the Sectoral Determination to not have an effect on written contracts.

Chapter 6

Conclusion

This paper has investigated the impact of the two major minimum wage shocks in the South African agricultural industry. The shocks that were focused on were the introduction of the minimum wage in the form of Sectoral Determination 13 in 2003, and the 52 percent minimum wage increase ten years later. The paper placed specific focus on labour market outcomes, namely employment, wages, hours of work and contract coverage amongst farm workers.

Overall, we observe that employment responded negatively to both shocks, and that these disemployment effects were sharper in areas with lower pre-law median wages, confirming our expectation that farms in areas with lower wages would need to make bigger employment adjustments in order to manage costs while moving towards compliance. The evidence also indicates that the employment effect of the first shock was greater than that of the second shock.

We cannot however, consider the overall employment effect without also investigating the impact on the hours worked by farm workers, thus the structure and composition of the remaining jobs in the industry. The evidence indicates that the initial minimum wage started a downward trend in the number of part-time jobs in the industry, an effect that was particularly sharp in high Wage Gap areas—resulting in an increase in the average hours worked by farm workers. As a result it was found that by the time the second shock occurred, very few part-time workers were employed in the sector. Thus, hours worked shifted only marginally in response to the second shock, suggesting that the industry had reached some optimal or minimum level of part-time workers between the first and second shocks. The paper therefore finds that the second minimum wage shock came at a time when most part-time farming jobs had already been shed, and that the employment adjustment to the 2013 shock was focused amongst full-time workers, a deeper culling of more productive jobs. Thus, the second shock many have had greater productivity implications than the first shock.

Wages also responded significantly to both shocks, with average wages rising by approximately 20 percent in both cases. These effects were also larger in areas with poorer pre-law conditions, suggesting that the laws were effective in reaching the most vulnerable workers. However, despite the significant wage effects overall, there is notable evidence that violation is a particular challenge in the sector, even in the long term. This brings into question the methods of minimum wage enforcement in the sector, where site inspections are generally not far-reaching, and can be of poor quality. Therefore, there is scope for enforcement to be

improved in the case of the agricultural minimum wage.

In terms of contract coverage, the introduction of the minimum wage had a significant impact on the number of farm workers with a written employment contract. Specifically, the minimum wage induced an upward trend in the proportion of farm workers with a written contract, resulting in a doubling of this proportion between 2003 and 2012. Because of this, the contract effects of the second minimum wage shock were muted, with little to no significant change in contract coverage. Thus, it is possible that contract coverage, like hours, reached some steady state in the period between the two shocks.

Lastly, our assessment of the second minimum wage shock also included an expectations model which estimated whether the labour market adjusted prior to the actual legislated change in the Sectoral Determination. The expectations model indicates that employment, wages and hours of work adjusted up to two quarters prior to the actual Sectoral Determination adjustment. These findings suggest that the labour market response to legislation such as a minimum wage is not necessarily a one-time occurrence, but that dynamic responses may take place.

There is significant scope for further research. Firstly, although the paper estimates both positive and negative labour market outcomes in isolation, it does not discuss the net welfare effect of the policies. Specifically, although employment decreased (a negative labour market outcome), wages and contract coverage simultaneously improved as a result of the Sectoral Determination. The positive impacts of increased wages can have significant spillover effects for farm worker families (particularly the elderly and children) and communities. Thus, investigating the impact of the policy on welfare variables such as farm workers' consumption and food security is an important area for further research.

Other improved working conditions, such as regulated working hours, equal pay for males and females, and maternity leave, are also possible outcomes of the law and these have not been investigated in this paper. These impacts can have significant welfare effects as well as having spillover effects for farming communities. For example, improved maternity leave may influence infant health-care outcomes. Thus, there is scope for further research in these areas.

Furthermore, the paper noted that the majority of the protest action surrounding the minimum wage hike was within the Western Cape. Thus, further research may investigate the differential impact of the law across strike and non-strike areas, exploring whether the response to the law was stronger in the Western Cape than in other areas.

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