

Estimating the wage and employment effects of a large increase in South Africa's agricultural minimum wage

Vimal Ranchhod¹ and Ihsaan Bassier^{2 3}

Abstract

What were the effects of a 52% increase in the minimum wage in the agricultural sector in South Africa in 2013? We estimate the short run effects of this policy change on the employment and income of rural farmworkers, using both repeated cross-sectional data as well as individual level longitudinal data from the Quarterly Labour Force Surveys (QLFS). We find that the law had a substantial effect on the earnings of rural respondents who were employed as farmworkers after the law came into effect, but that there were also substantial job losses. The descriptive evidence from the cross-sections indicates an increase in real mean income of 19% per month amongst rural farmworkers, about a year after the law came into effect. At the same time, we observe a mean decrease in adult employment by this industry of about 20%, or over 6 percentage points in absolute terms. Our regression results, which makes use of longitudinal data from the rotating panel component of the QLFS, supports the claim that the law caused these changes. These results suggest that caution is warranted when considering minimum wage policies, particularly when large increases are being considered in a low wage sector.

¹ Chief Research Officer, SALDRU, School of Economics, University of Cape Town. Corresponding author: vimal.ranchhod@gmail.com

² Graduate research assistant, SALDRU, School of Economics, University of Cape Town.

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1. Introduction

What were the effects of a substantial increase in the minimum wage in the agricultural sector in South Africa in 2013? Following worker protests primarily in the Western Cape province, the national minimum wage for farmworkers was raised by 52%, from R69 to R105 per day. We estimate the short run effects of this policy change on the employment and income of rural farmworkers, using repeated cross-sectional data as well as individual level longitudinal data from the Quarterly Labour Force Surveys (QLFS). These are large, nationally representative household surveys which are administered by StatsSA, the national statistical agency. We use variation in individual farmworkers' wages prior to the law for empirical identification. Our primary findings are that the period following the enactment of the law was one in which wages rose steeply while employment rates in agriculture fell sharply, leaving the aggregate wage bill for farmworkers in commercial farming areas approximately unchanged. Our analysis indicates that these changes can be causally attributed to the change in the law.

Our paper adds to the already substantial body of evidence on the effects of minimum wages in two ways. First, it adds to the relatively small literature on the effects of minimum wages in developing countries in general, and South Africa in particular. Second, even within the global minimum wages literature, there remains some debate about why there is ambiguity in the estimated employment effects of minimum wages. Is the observed ambiguity in empirical studies because there is true ambiguity in the effects of minimum wage increases on employment; or is it the case that the papers that find no employment effects are finding these because the marginal increases in the levels of the minimum that are used for empirical identification are generally quite small? Put differently, are we still likely to find small and statistically insignificant dis-employment effects in response to proportionately large increases in a minimum wage?

In addition, our paper speaks to an important labour issue that will probably become increasingly relevant in several other African countries. In rural areas in South Africa, agriculture historically accounted for a substantial amount of employment of relatively low skilled workers. This continues to be the case, but over the past three decades, agriculture has become increasingly commercialized and mechanized, and agricultural produce is increasingly being sold on highly competitive globalized markets. At least to some extent, these factors may explain why the long run trend in agricultural employment has been negative. An interesting

and difficult policy question arises as to how to a government might protect workers' well-being in such an environment, where agricultural workers have amongst the lowest mean wages in the entire economy. In particular, is it possible to maintain both wages and employment in agriculture as the sector evolves in response to global pressures?

The remainder of our paper is structured as follows: In Section 2 we review the international and South African empirical literature on minimum wages. Section 3 provides some background and context in the sector, as well as a description of the law, while Section 4 contains a summary of the data and related descriptive statistics. Our empirical methods are discussed in Section 5. Section 6 contains our main regression results, Section 7 presents some caveats and robustness tests, and we conclude in Section 8.

2. Literature Review

The consensus on the impact of the minimum wage on employment and income has changed considerably over the past 20 years. Economists became increasingly certain during the 20th century of the standard supply and demand model of the labour market, which predicts employment losses in response to increases in a minimum wage, with one poll in 1987 recording that 90% of economists agreed with this prediction. But by 1995, Card and Krueger wrote that “in the United States, the debate over the minimum wage has shifted from the question of whether minimum-wage increases cause small or large job losses to the question of whether minimum-wage increases cause any loss of jobs at all”. This view was contested by Neumark and Wascher, who compiled a popularly cited review, claiming that “the oft-stated assertion that recent research fails to support the traditional view that the minimum wage reduces employment of low-wage workers is clearly incorrect” (2007:121). In their review, the majority of studies do suggest a negative effect.

According to Brown (1988), economists' captivation with the subject is due to the strong theoretical predictions about the direction of the effect of the minimum wage on employment, combined with the convenient natural experiments to test these predictions: often, the laws can be classified as an exogenous shock and the labour turnover for the targeted population is high, leading to responsive adjustments. In addition, minimum wage laws affect large numbers of workers who are often the most vulnerable. These laws are thus popular policy tools presented as serving the interests of workers and around which there exists strong ideological alignments.

Because minimum wages potentially have important welfare implications, much empirical research has been conducted to identify their effects. The primary focus has been on employment, since the most worrying possibility is the potential for job losses that would take some workers from a steady monthly income to no income. This can be particularly harmful in contexts where there is limited unemployment support, either institutionally or through limited labour market alternatives, which is the case for most unskilled workers in South Africa. Income is also examined as it indicates compliance with the policy, and the related wage bill is often used as a yardstick for the success of the policy.⁴

2.1 International Minimum Wage Literature

Although a large literature has developed, the effects of the minimum wage remains contested. The ranges of estimates goes from between severely negative to insignificant effects, while a few studies find positive effects. Table 1 gives an overview.

Note that Table 1 only reports ranges: while it is clear that the lower bound of unemployment effects is severe, the range masks the large number of studies reporting insignificant or small effects. Neumark and Wascher concede that “economic theory often fails to make an unambiguous prediction about the employment effects of minimum wage” (2007:4).

In the review of studies and results, a few trends are observable. From the OECD, the UK and Sweden, there is evidence that unemployment effects may be mitigated, for example, through employment protection, active labour market policies and bargained minimum wages. Secondly, studies focusing on lower-skilled groups within affected sectors tend to find more negative effects, suggesting a relative concentration of the harm. And thirdly, Almeida and Terrel suggest in a review of minimum wages in developing countries that employment elasticities become more severe in proportion to the wage gap (2008) - although notable exceptions do exist.

⁴ Other effects have also been tested; such as the impact on workers’ training, the uncovered sector, poverty and inequality - although these are not the focus of this paper.

Table 1: Comparison of employment effects in minimum wage studies across regions. Studies vary between national and sectoral minimums.

Region	Studies reviewed	Employment elasticity	Comments
Industrialised countries	Studies: 32, 10 considered reliable Countries: 10 Two additional international panel studies	Range: -0.54 to 0.07* (-1.6 to 1) Mostly negative, with many insignificant and positive effects for the UK, Greece and Sweden.	Negative effects diminish when subminimum exists or wage has been negotiated. Effects worsen for subsectors.
Latin America and Indonesia	Studies: 15, 5 considered reliable Countries: 8	Range: -0.34 to 0.05 (-0.54 to 0.20) Again, many insignificant results. More negative effects observed for some women.	Estimates may be influenced by political variables; most minimums indicate sharp wage increases.
South Africa	BKM (2013) - 5 out of 11 sectors DR(2010) - Domestic workers	Insignificant employment effects, though some evidence of reduction in hours.	Only partial compliance observed.

**This is the range considered reliable by Neumark and Wascher, with the full range of reported results bracketed. Outlier subsector effects are omitted. Source: Non-South African studies adapted from Neumark and Wascher (2007). BKM = Borat, Kanbur and Mayet; DR = Dinkelman and Ranchhod.*

A number of methodological concerns result in a large number of the above studies being unreliable, in the view of Neumark and Wascher. Common problems are the use of an unconvincing counterfactual, not accounting for the endogeneity of the minimum wage (timing often coincides with booms), and the erosion of the real wage. They further point out that longer term, lagged capital-labour substitution effects are an important, although often unexplored, part of the story.

Another concern is that minimum wage studies of the USA and other industrialised countries, which dominate the literature, may be incomparable to the developed world. Brown (1988) notes that most of those affected by the minimum wage in the former group are teenagers from

relatively high income families. This is true for many of the studies cited in Table 1, and is very different to the developing country context where a large proportion of the labour force earns at the minimum wage level. Other issues in comparisons include informal sector effects, compliance, anti-sweatshop campaigns creating excessive artificial upward pressure, and high inflation levels that quickly mitigate real wage increases.

2.2 South African Minimum Wage Literature

South Africa first introduced sectoral minimum wages in various sectors in 1999, a few years after the end of Apartheid. Table 1 shows the general prevalence of insignificant unemployment effects. One of the issues that has been raised is that the enforcement of minimum wage laws has been incomplete, although significant increases in hourly wages have been found. Some authors have suggested that perspectives of fairness, as in the case of the domestic worker sector, may have increased compliance, despite a lack of enforcement (Dinkelman and Ranchhod 2010).

While most employment effects may be insignificant, the costs of minimum wages may have been expressed in different ways. Adjusting on the intensive margin, hours, has been a key mechanism used by employers to mitigate the effects of minimum wages. In the forestry and taxi industries, the reduction in hours was enough to offset the wage increase, leaving employees on aggregate no better off in terms of earnings than they were prior to the increase in the minimum (Bhorat, Kanbur and Mayet 2013).

In addition, partial compliance characterises employers' responses (Bhorat, Kanbur and Mayet 2012). Generally, up to half of the employees can be observed as being paid below the minimum wage following the law. However, a clear shift in wages coinciding with the law also presents itself. Part of this is explained by institutions of wage reductions in return for benefits.

Bhorat, Kanbur and Stanwix (2014) examine the effects of the first minimum wage for the agricultural sector, which was passed in 2003. They use a difference in differences estimator, where the control group is made up of unskilled, non-unionised workers and the independent variable, the wage gap, is defined by district as the difference between the log median wage of the control group and the log median wage of the agricultural farm workers.

Noting that the 2003 minimum wage was set at a relatively high level (the 70th percentile), they find strong evidence of a negative employment effect together with a positive effect on total income. Hours are insignificantly affected, and an increase in non-wage compliance is observed. Overall, the worry remains that the most vulnerable workers, those retrenched, were the losers of the law. In addition to the possibility of decreases in non-monetary benefits, the authors also note the possibility of an increased employment of casual workers in place of permanent employees.

Other researchers have analysed the sugar (Murray and van Walbeek 2007) and Western Cape grape (Conradie 2005) farming subsectors, both finding insignificantly negative employment effects. Garbers (2015) uses an unbalanced panel of 53 District Councils across 19 waves to estimate effects on employment, wages, skills distribution and capital substitution, with variation coming from area-values of the minimum wage. His estimates are high, with employment elasticity of -1.3 and a tractor sales elasticity of 1.54.

3. Background of the Agricultural sector

3.1 Qualitative evidence on employment in the agricultural sector

The ILO recently commissioned a comprehensive report on farmworker living and working conditions (Ferrer and Visser, 2015). The authors estimate that farmworkers inhabit close to 600 000 households, with over 2 million people residing in these households. They observe a shift in labour practice, where “feudal relationships between farmers and farm workers are increasingly breaking down through movement off farms (for various reasons, including, but not only, evictions) and a shift away from use of permanent workers towards the use of indirect labour and short-term employment contracts” (2015:1). There is a lack of rural infrastructure outside of farms, which is worsened due to incoming migrant labourers.⁵

This feeds into Hall’s (2014) characterisation of the agricultural sector as a low wage industry that has been exhibiting strong negative trends over the past four decades: shedding jobs,

⁵ Note that the above description excludes farms in former Apartheid Bantustans, which houses almost a third of South Africa’s population and generally consists of small, labour-intensive subsistence farming.

casualising labour, consolidating from smallholder farms into large commercial farms, and a decline in the social wage. In addition, there is high variability in agricultural employment levels, such as the shedding of 500 000 jobs in 2001 (two years before the first minimum wage) and the increase of 181 000 jobs in 2005-2006. Together with strong seasonal fluctuations, this makes causal analysis challenging.

Both Hall and the ILO reports highlight market deregulation and globalisation as root causes of these long term trends. Following the transition to democracy in 1994, state subsidisation and agricultural tariffs were reduced considerably. This integration into global food chains resulted in South African farms becoming price takers on global markets, as well as following a global trend towards farm consolidation. Other explanations for the long term trends in employment include the rising cost of intermediate goods and an increase in labour costs.

3.2 The 2013 minimum wage

Coming to the focus of this paper, the 2013 minimum wage was introduced with effect from the 1st of March 2013. It was to some extent a negotiated wage, at approximately the middle point between the prevailing R69 minimum wage and the R150 being demanded by farmworkers, taking into consideration affordability for farm owners. R105 was the final legislated new minimum wage, which represented a 52% increase from the previous minimum.

A few studies have attempted to describe the impact of the minimum wage. The above mentioned ILO report analysed a small number of farms, finding that of the farms that reduced employment in 2013, most reduced seasonal labour, which affected females in particular. In fact, of the primary strategies in adjusting to the law, they highlight casualisation, reducing hours, shortening of contracts, increasing productivity targets and cutting benefits. Additionally, a case study of a few suppliers of farming machinery indicated an increase in mechanisation. However, these are all individual cases and cannot be generalised to the sector.

Another ILO report, in partnership with the Labour Research Service and headed by Cottle, conducted a brief general descriptive analysis of wages in this sector (2015). They find a decrease of 55 000 farmworker jobs leading up to 2014, though they accompany this with the caution that attribution is tricky and that much larger fluctuations in employment unrelated to labour costs has not been uncommon. Overall, the wage bill increased by R1.5 billion in 2013

and a further R1.6 billion in 2014. Interestingly, the wage bill in 2013, post the new law, still only accounted for just over 10% of total farming costs (Cottle 2015: 28).

The complexity of the agricultural sector makes disentangling the minimum wage effects from other confounding factors rather challenging. We attempt to do so through more detailed descriptive analysis and econometric estimates, the results of which are presented in the subsequent sections.

4. Data and descriptive statistics

4.1 Data: Quarterly labour force surveys

We make use of twenty waves of StatsSA's Quarterly Labour Force Surveys (QLFS) for our study, using all quarters or waves between 2010 and 2014. Out of these 20 waves, just over 12 precede the minimum wage, which was implemented two thirds of the way through the 13th wave. These are nationally representative datasets which are collected four times per year. The surveys are administered to each household member above the age of 15, and questions are asked about labour force participation, industry and occupation if employed, earnings, hours of employed, and some other characteristics such as whether the person has a written contract or not. Since wage data is only available for each year through the Labour Market Dynamics in South Africa (LMDSA) release (a combination of each year's four QLFS releases), the wage variable from the LMDSA was merged back onto the relevant QLFS using each person's unique identification code. The wage data was converted to a monthly value and adjusted for inflation, using the quarterly CPI benchmarked on December 2012.

For our regression analyses, we make use of a particular subset of the QLFS. Over the 20 waves that we are using, the QLFS has a rotating panel component at the dwelling level, with a 25% out-rotation rate. By working with StatsSA, we were able to match individuals who had maintained residency in the same dwelling over time, using data from their names, surnames, age, race and gender. We thus have a sub-sample of individuals who are observed in multiple consecutive waves, for a maximum of four waves. Our identification strategy involves using variation in pre-existing wages amongst rural farmworkers in the wave that contains the date when the law came into effect, and identifying whether this was systematically related to job losses and/or wage gains.

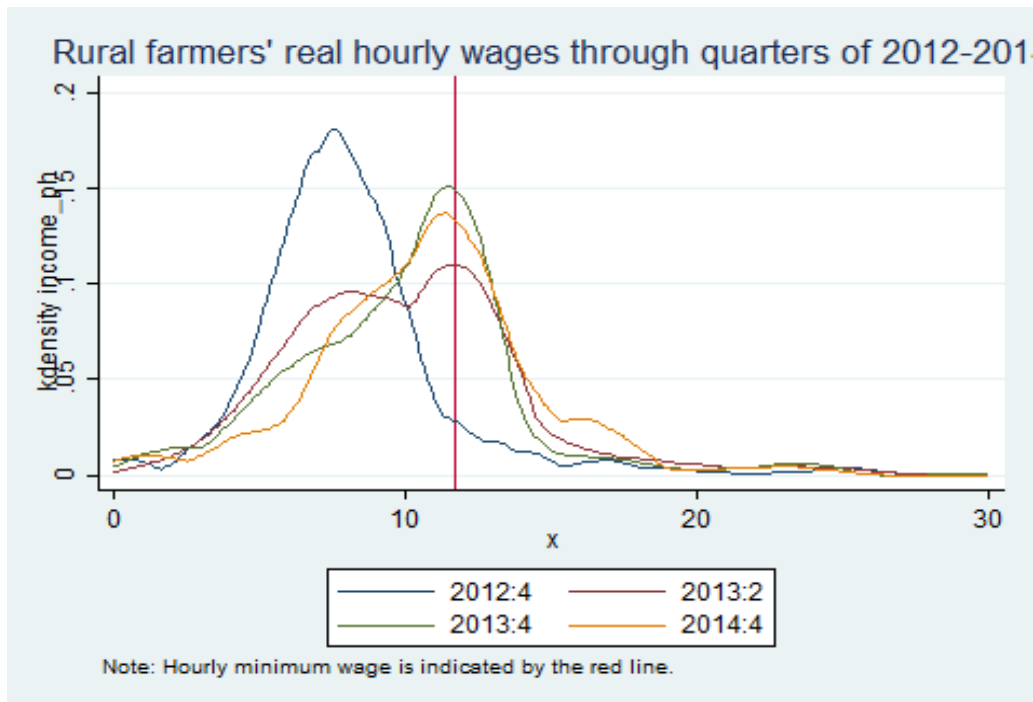
For the purposes of this study, a “farmworker” is any adult aged 15 to 64 who self-identifies as (a) having an occupation other than a manager, professional or clerk, (b) working in the crop or animal farming industries, and (c) with an income less than R5000 (or missing). We chose to focus on rural farmworkers because farmworkers make up about half of all employment in rural areas. Thus the population of interest for this paper, rural farmworkers, are simply those farmworkers living in rural areas. We imposed this geographic restriction as over half of all employment in rural areas take place in agriculture, while in other geographic areas the proportion of farmworkers is relatively small.

In our regressions, our dependent variables are *pctwagegain* and *jobloss*. *Pctwagegain* is the observed percentage increase in real wages for a person who was a rural farmworker both before and after the law, and is thus defined only for the subset of farmworkers who maintained employment within the agricultural industry. *Jobloss* is an indicator variable that takes on a value of 1 if a farmworker in an earlier wave is subsequently observed to have changed industry or to no longer be employed. The explanatory variable is a *pctwagegap* variable that measures the percent below the minimum that a rural farmworker’s wage was in wave 13, i.e. the wave that contains the 1st of March 2013.

4.2 Descriptive statistics

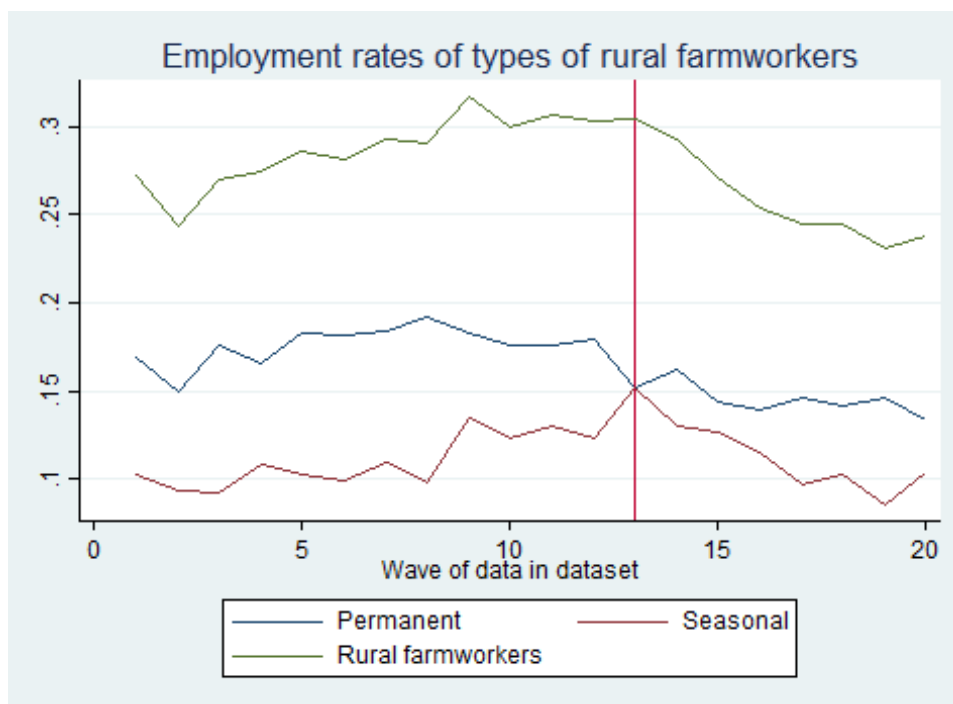
The graph below shows kernel density estimates of the monthly real wage distribution of rural farmworkers, for various wave’s data.⁶ What we can see is that the real wage distribution shifts sharply to the right in the period just after the law came into being, and that the mode of the distribution moves exactly to the point that one would have anticipated given the level that the minimum was set at. In addition, it seems that most of the adjustment occurred within one year after the law, as the difference between the distributions one year after the law and two years after the law came into effect does not appear to be that pronounced. Our summary evidence then is that wages did increase, and that this increase probably was due to the new minimum wage.

⁶ We chose to include only a select number of waves as the graph becomes overwhelming with all of the data, and it becomes more difficult to see how the wage distribution shifted as time passed.



The next graph that we present shows how the labour absorption rate changed over our 20 waves of data. We present the aggregate percent of adults employed as farmworkers, and further separate this group into permanent and seasonal agricultural workers. What we observe is that, after the law, there is a substantial downward trend in each of these sub-groups of agricultural workers, although the decline is stronger amongst seasonal workers. The aggregate of these two groups combined thus shows an even stronger decline in the number of farmworkers of either type, which indicates that the law coincided with a substantial decline in agricultural employment in rural areas.

In the cross sections, we observe that the mean real wages increased from R1580 per month between 2010 to 2012, to R1880 per month over the period from 2013 to 2014. At the same time, the percentage of the adult rural population decreased from between 30 to 31% in 2012 to approximately 24% in 2014. The question is whether these changes can be attributed to the change in the minimum wage, or are due to some other confounding factors that affect both the wage distribution and the employment rates simultaneously.



5. Empirical Methods

In order to estimate the causal effects of the law, a number of empirical approaches may be employed. The existing literature provides a number of illustrative examples that we considered. One of the most popular approaches is the difference-in-differences method (DD) which was used in the paper by Card and Kruger (1994). This method involves identifying a group of similar workers who would experience the same trends in employment and wages absent the law, but where some workers are subject to the law and some are not. This provides for a natural experiment to estimate the difference between the treated and untreated groups.

In our case, however, it is difficult to imagine who the comparison group is that would experience the same trends and shocks as agricultural workers, but who are unaffected by the law. First, unlike Card and Kruger, we do not have geographic variation as the law was a national law for the entire agricultural sector. Second, we might consider workers in other sectors but the shocks to agriculture, such as weather and pestilence, can be highly idiosyncratic and would be unlikely to affect workers in other industries in a similar manner. This would apply regardless of whether we considered a single other industry or a composite of workers from multiple other industries.

Ultimately, we decided to use individual level variation in wages amongst rural farmworkers in wave 13 to measure variation in treatment intensity, and to test whether this variation is related to the likelihood of subsequent wage gains and job loss.⁷

We thus estimated regression models with either job loss, change in hours worked or percent wage gain as the dependent variable, where the percentage wage gap in wave 13 is the main dependent variable. We then varied the time at which the outcome variables are measured to waves 14, 15 and 16. This allows us to observe the time path of adjustments amongst our cohort of farmworkers. We estimated our regression models using the conventional sampling weights, as well as using an adjusted *inverse probability weight*, which corrects for non-random attrition that is related to other observable characteristics.⁸

Our regressions were estimated both with and without additional covariates. The ones with covariates included a quadratic in age, a gender dummy and a race dummy.

Formally, for $t=1, 2$ and 3 , and wave $t_0 = \text{wave } 13$, we estimated:

$$Y_{i,t} = \beta_0 + \beta_1 \text{pct_wagegap}_{i,0} + \beta_2 X_{i,0} + \varepsilon_{i,t}$$

Where :

$$\text{pct_wagegap}_{i,0} = 100 * (2275 - \text{wage}_{i,0}) / 2275$$

$X_{i,0}$ are age, age squared, Coloured and Female dummies

Y_i are Δ hours worked, employed as a farmworker, and pct_wagegain (from t_0)

And the estimation sample is restricted to rural farmworkers in wave 13.

6. Regression results

Our regression results are presented in Table 2 below. For each outcome variable, we present only the regression results that includes the covariates as well as using the IPW weights. The estimates represent the coefficients for changes in the dependent variables for wave 14, 15 and 16 respectively.

For the wage gain variable, we find that a 1 percentage point increase in the wage gap in wave 13 is correlated with a 0.484 percentage point increase in wage growth after the law came into

⁷ Our estimation sample was restricted to African and Coloured respondents.

⁸ The two different weights do not affect the results in any substantive way.

effect. This is clearly positive and statistically significant, but is also substantially less than 1, which corresponds to an imperfect compliance situation.⁹ The *jobloss* regressions show that the probability of job loss is positively related to the wage gap in wave 13, and that this increases from 0.001 in wave 14 to 0.00276 in wave 15. The wave 15 coefficient is statistically significant at the 5% level. By wave 16, the coefficient is fairly similar to what it was in wave 15, but is no longer statistically significant, although this may be due to the fact that we have many fewer observations of farmworkers from wave 13 who we continue to observe in wave 16, due to the nature of the rotating panel design. The regression results for employment effects on the intensive margin show very little significant changes.

Table 2: Regression results

VARIABLE	% wage gain t1-t0	% wage gain t2-t0	% wage gain t3-t0	jobloss t1-t0	jobloss t2-t0	jobloss t3-t0	Hours change t1-t0	Hours change t2-t0	Hours change t3-t0
pctgap (wave 13)	0.484* ** (0.097)	0.471* ** (0.125)	0.484* (0.258)	0.00105 (0.000748)	0.00276** (0.00108)	0.00204 (0.00254)	-0.0297 (0.0187)	-0.0118 (0.0231)	-0.0566 (0.0485)
Observations	278	151	51	301	167	61	278	150	51
R-squared	0.149	0.123	0.145	0.011	0.070	0.337	0.035	0.114	0.058

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Reported results include covariates.

Regressions are estimated using Inverse probability weights to correct for attrition related to observables.

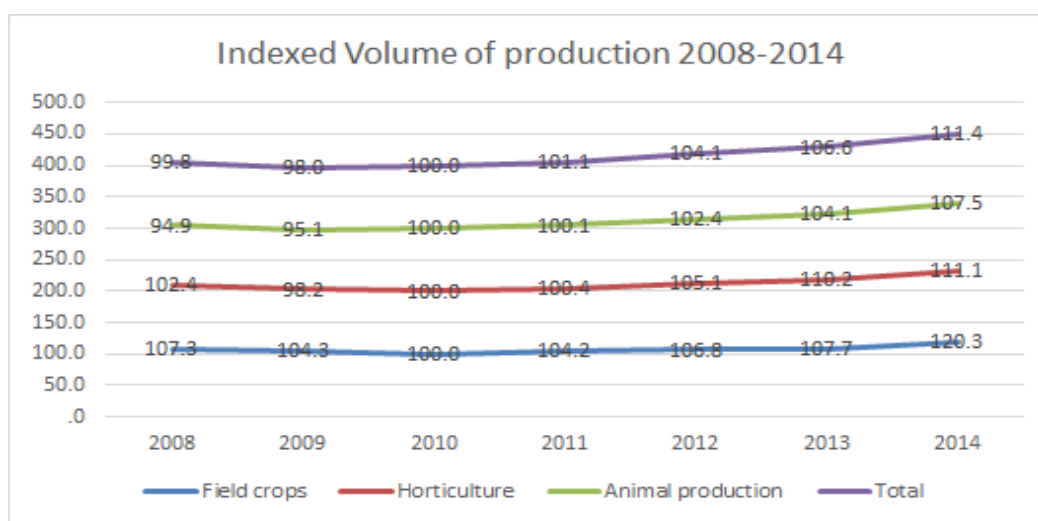
Overall, we find clear evidence that the law did increase the wages of farmworkers who maintained employment, while there is some evidence that the downward trends in employment can also be attributed to the law.

7. Caveats and robustness tests

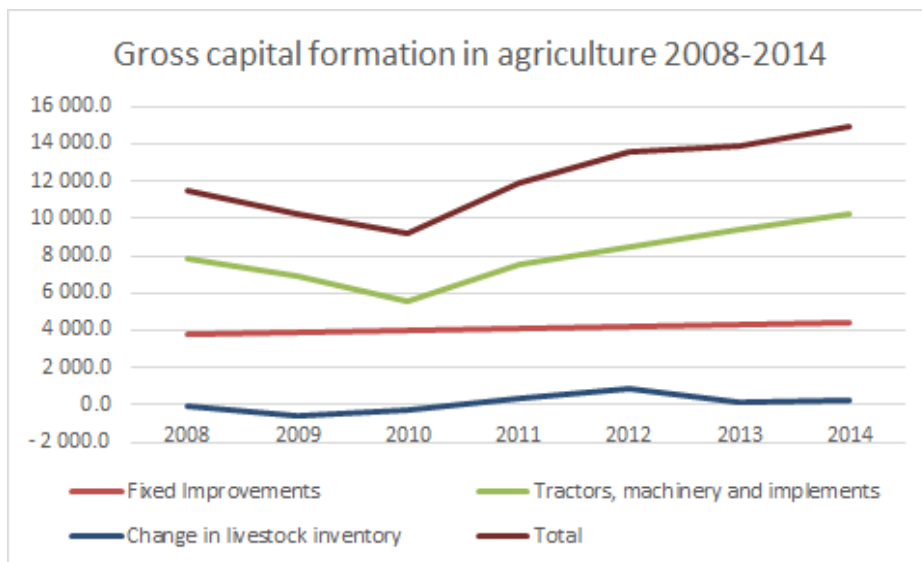
⁹ Although it could also be reflecting substantial levels of measurement error in the income variable.

There are a few potential threats to our findings stated above. First, there may be confounding factors that are driving both the increase in wages and decrease in employment that are not due to the increased minimum wage level. There are also some econometric issues, such as mean reverting measurement error and non-random attrition that could be driving the panel related results.

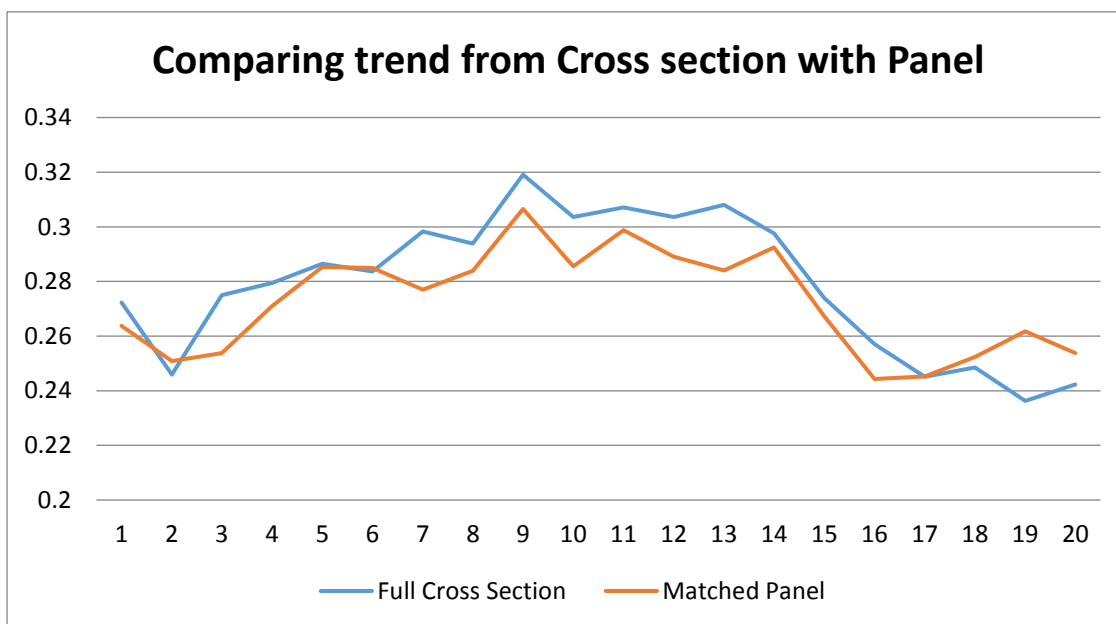
In this section, we try to address these issues where possible. In the figure below, we plot agricultural output per annum, as obtained from the *Department of Agriculture, Forestry and Fisheries Annual Report 2015*. We see that output was increasing in a stable fashion over this period, which could explain wage increases but not employment decreases.



One possibility to reconcile employment decreases with output increases would be to observe substantial increases in capital investment. Note that this could be an outcome of the law though, and would be one way in which farmers could respond to the increase in labour costs. We next plot gross capital formations from 2008-2014, where the data was obtained from the same report. Our observation is that investment in capital was indeed increasing over this time period, although the upward trend started by 2011 and this was simply maintained in 2013 and 2014. There is thus insufficient evidence on the capital formation side to explain a sharp reduction in agricultural employment due to investments in capital in 2013 alone.



Our next concern may be that the panel results are driven by sample selection rather than 'true' effects. We cannot be certain about this, but we do use the inverse probability weights in our regressions. In addition, we can ask how well our aggregate trends from the panel subsample tracks that of the full cross sections. This is presented in the graph below.



While it is clear that the two samples have slightly different levels of employment, their trends do match each other reasonably well. Since our estimates are all being driven by changes in employment, income or wages, the similarity in the trends is likely to capture the overall changes. Moreover, the change in trends in the panel are more moderate than those in the cross-

section, both in terms of the highs and the lows, and as such, we might expect our findings to be conservative.

Finally, with respect to potential mean reverting measurement error, there are different effects for the employment regressions and the wage gain regressions. For the former, it makes our estimates less likely to identify any effects, while for the latter, because the measurement error will affect both the explanatory variable as well as the dependent variable, the effects are more difficult to be certain of.

Taking all the evidence into consideration, and having considered all the different caveats, on balance we conclude that the minimum wage did indeed cause both a substantial increase in wages as well as a substantial decrease in employment.

8 Conclusion

We investigated the effects of a large (52%) increase in the minimum wage for agricultural workers in South Africa in 2013. Our descriptive evidence indicated large shifts in the wage distribution, with the mode shifting to the new minimum, although there remained substantial levels of non-compliance. At the same time, there was a sustained and large decrease in employment in this sector in the year following the increase in the minimum. These decreases in employment were contrary to prevailing trends in employment, and also do not coincide with substantial decreases in the volume of agricultural output.

By using the rotating panel component of the QLFS data, we estimated a number of longitudinal models using pre-existing wages for identification. We found that workers who previously earned below the minimum subsequently received greater wage increases and were also more likely to lose their jobs 6 months after the minimum was introduced. A number of robustness checks all support the argument that the decrease in employment observed is causally related to the increase in the minimum.

As with all minimum wage studies, the welfare effects of the law need to be considered quite carefully. There are both winners and losers from the law, as well as distributional implications both within and between households, which this paper has not considered. While South Africa is about to implement a national minimum wage, the evidence here supports an exemption for agricultural workers. In addition, one of the contributions to the broader minimum wages literature relates to the magnitude of the increase. This particular case study, which involved a

very large increase in the minimum, does correspond to the conventional theoretical prediction in that an increase in the minimum wage caused a substantial decrease in employment.

9 References

Almeida, R., Terrell, K. (2008) Minimum wages in developing countries: helping or hurting workers? World Bank Employment Policy Primer, No. 10

Bhorat, Haroon, Ravi Kanbur, and Natasha Mayet. (2012) "Minimum wage violation in South Africa." *International Labour Review* 151.3: 277-287.

Bhorat, H., Kanbur, R. and Mayet, N (2013) The impact of sectoral minimum wage laws on employment, wages, and hours of work in South Africa. *IZA Journal of Labour and Development*.

Bhorat, H., Kanbur, R. and Stanwix, B. (2014) Estimating the Impact of Minimum Wages on Employment, Wages, and Non-Wage Benefits: The Case of Agriculture in South Africa. *American Journal of Agricultural Economics*, Vol. 96, No. 5, p 1402-1419.

Brown, C. (1988) Minimum Wages: Are they overrated? *The Journal of Economic Perspectives*, Vol. 2, No. 3., p. 133-145.

Card, D., and Krueger, A. 1995. *Myth and Measurement: The New Economics of the Minimum Wage*. New Jersey: Princeton University Press.

Conradie, B. (2005). Wages and wage elasticities for wine and table grapes in South Africa. *Agrekon* 44 (1), 138–156.

Cottle, E. 2015. *Towards a National Minimum Wage*. ILO and LRS.

Dinkelman, T and Ranchhod, V. 2010. Evidence on the impact of minimum wage laws in an informal sector: Domestic workers in South Africa. A Southern Africa Labour and Development Research Unit Working Paper, No. 44. Cape Town: SALDRU, University of Cape Town.

DPRU. 2008. Minimum wages, employment and household poverty: Investigating the impact of sectoral determinations. University of Cape Town.

Ferrer, S., and Visser, M. 2015. Farm Workers' Living and Working Conditions in South Africa: key trends, emergent issues, and underlying and structural problems. International Labour Organisation.

Food and Agriculture Organisation. 2005. Fertilizer use by crop in South Africa. United Nations.

Garbers, C. 2015. The Impact of the Agricultural Minimum Wage on Farmworker Employment in South Africa: A Fixed Effects Approach

Hall, R. 2014. Towards a national minimum wage: what do we know about wages and employment in agriculture? Institute for Poverty, Land and Agrarian Studies, University of the Western Cape. Parliamentary hearings.

Hall, R. 2004. A Political Economy of Land Reform in South Africa. *Review of African Political Economy*, Vol. 31 No. 100. Taylor and Francis Ltd.

Murray, J. and C. Van Walbeek (2007). Impact of the Sectoral Determination for farm workers on the South African sugar industry: Case study of the KwaZulu-Natal North and South Coasts. *Agrekon* 46 (1), 94–112.

Neumark, D. and Wascher, W. (2007) Minimum Wages and Employment. IZA Discussion Papers No. 2570.