Agricultural producer responses to minimum wage changes

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1. Introduction

The study of minimum wage adjustment channels has received much attention in the broad literature. We identify two main streams of minimum wage literature - the supply and demand-side streams. Supply-side studies employ household survey data to investigate the impact of minimum wage changes on wages and employment, at the individual level. A common finding presented by the supply-side studies is that the minimum wages increase workers' earnings at the bottom of the wage distribution. However, there is no consensus on the impact of minimum wage changes on employment. While many empirical studies show that minimum wages decrease employment (Paredes and Riveros, 1989; Chacra Orfali, 1990; Cowan et al 2004), some studies find that minimum wages have no significant impact, and others present positive effects on employment (Martinez et al., 2001; Miranda, 2013)

Demand-side literature presents a broader picture of the effects of minimum wage increases on the economy. These studies use firm-level data, mostly producer surveys, to evaluate the impact of minimum wage changes on multiple firm-level outcomes, including employment, wages, profits, sales revenue etc. So, unlike household survey data, firm-level data allow the researcher to study the minimum wage effects on other stakeholders, like employers and consumers. Demand-side studies are relatively scarce due to the difficulties in accessing firm-level data l. Moreover, the available demand-side studies mainly focus on developed economies, and the few studies on emerging economies concentrate exclusively on the manufacturing sector.

The present study contributes to the scarce demand-side literature with a focus on emerging economies. Our study is significant on three primary levels. Firstly, we use administrative tax data to study minimum wage effects. While administrative tax data are challenging to access and require a lot of effort to clean to make them usable for research, they have many attributes that make them

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desirable compared to survey data. These attributes include increased accuracy, larger sample sizes, and sensitive information that respondents are less likely to provide in a survey. Secondly, while South African minimum wage literature extensively focuses on the employment channel, our study provides a broader picture of the effect of minimum wages on South Africa's economy by exploring other firm-level margins that shift in response to minimum wage changes. Finally, with our rich data, coupled with a focus on the agricultural sector, where employers are likely to face monopsonistic competition in the labour market, the study provides on the agriculture sector's labour market challenges in emerging economies.

Using the Difference-in-differences estimation technique, we studied the effects of a large minimum wage increase on South Africa's farming sector. Our empirical findings show that low-wage farms experienced a significant increase in labour costs. In response to increased labour costs, we show that low-wage farms gradually decreased their demand for labour overtime. Furthermore, we present evidence of an increase in sales revenue, profits, capital intensity and efficiency in low-wage farms following the minimum wage hike.

The logical structure of the paper is as follows. First, we present the background of the study in Section 2. Section 3 presents the theory and empirical evidence of the effect of minimum wage adjustment channels. In Section 4, we describe the identification strategy employed in this study. In Section 5, we describe the data and present summary statistics. Our results are presented in Section 6, and Section 7 concludes the paper.

2. Background

South Africa introduced its National minimum wage in 2019. Before 2019 sector-specific minimum wages prevailed in the labour market. Sectorial Determination 13, the instrument used to regulate employment conditions in the agriculture sector, introduced minimum wages in 2003. As a result of farmworker strikes in the Western Cape province at the end of 2012, the agricultural sector experienced an almost 50% increase in minimum wages from ZAR70 to ZAR105 per day, as of 1 March 2013. This significant increase provided a good testing ground for the effects of minimum wages. In this study, we analyse the impact of the 2013 minimum wage hike on the evolution of multiple firm-level outcomes.

Supply-side studies have explored the employment effects of the 2013 minimum wage hike. They present evidence of disemployment effects (Bhorat *et al.,* 2014; Garbers *et al.*, 2015; van der Zee, 2017; Piek & von Fintel, 2019, Piek *et al.*, 2020). Due to the lack of firm-level data in South Africa, demand-

side studies on minimum wage effects are scarce. To the best of our knowledge, only one study has explored the demand-side effects of the minimum wages in South Africa, presenting empirical evidence of a significant increase in labour costs after the minimum wage hike (Tan, 2021).

3. Theory and evidence on minimum wage adjustment channels

Labour market models present varying assumptions about the labour market and predictions of the effect of minimum wages on firms' decisions. The main models used to assess the impact of minimum wages include the neoclassical competitive, monopsony, institutional and search-theoretic models. These models help us to understand that there are several margins which firms can shift when responding to a binding minimum wage. In addition to employment adjustments, firms can internalise the minimum wage costs by cutting non-labour expenses, improving overall efficiency, or passing a portion of the costs to consumers by increasing the prices of goods produced. Failure to employ any adjustment channels can decrease sales and profits due to increased costs induced by the minimum wage increase.

The neoclassical competitive model presents a frictionless labour market, and as such, wage floors result in the reduction of employment in the absence of other channels (Lester 1960, Hirsch et al. 2015, Wilson 2012, Kaufman 2010, Lee and Saez 2012, Schmitt 2013). However, employment adjustment is not limited to reducing employee head count. A firm can also react by cutting the number of working hours. The firms in the neoclassical model can also respond to wage floors by cutting non-wage benefits and reducing investment in the training of low-skilled workers.

Relaxing the *ceteris paribus* assumption and introducing non-fixed output prices allows one to investigate the price transmission channel in the competitive model. A price increase in response to a minimum wage increase depends on the elasticity of the goods produced (i.e. the ability to increase prices without losing customers). Unlike firms in tradeable sectors, firms in non-tradable sectors can pass the cost increases to consumers due to the inelastic demand for their goods. Where the minimum wage is binding, firms can also mitigate the minimum wage effect by reducing fringe benefits such as employer-provided health insurance (Clemens, Khan, and Meer; 2018). Furthermore, since firms operate at maximum efficiency, there is no room for efficiency improvements in the neoclassical model.

Search and monopsony models account for market imperfections (Cahuc 2014, Flinn 2006; Rogerson et al. 2005; Ashenfelter et al., 2010). These models aim to address some key issues which the competitive model does not easily address. Here, wage floors can positively affect employment (Manning, 2003; Ashenfelter et al., 2010). Search models allow for the coexistence of unemployed

individuals and unfilled job vacancies. Therefore, an increase in minimum wages can boost job search, leading to a rise in employment and improved efficiency. Similarly, in the monopsony models, individual firms face an upward-sloping labour supply curve, where employment is an increasing function of wages. So, in monopsony theories, minimum wage increases lead to increased employment. In addition, monopsonistic market power allows firms to pass some of the minimum wage costs to consumers through output prices.

Firms in the institutional model (Kaufman 2010, Hirsch et al. 2015, Lester 1960, Hall and Cooper 2012, Schmitt 2013, Wilson 2012), unlike the neoclassical model, have room to improve economic efficiency. This model predicts that a firm's immediate response to high minimum wage costs is to improve efficiency by adjusting the flexibility of work schedules, effort requirements, and investing in employee training opportunities (Clemens, 2021). Firms here can also increase the prices of their products to complement the increase in economic efficiency.

The perfectly and imperfectly competitive labour market models do not account for some adjustment channels that are empirical realities – such as non-compliance. The models assume a binding minimum wage. However, firms may choose to not comply with minimum wage legislation when minimum wages are relatively higher than average wages or when firms fail to pass the increased cost to consumers (Goraus-Tanska and Lewandowski, 2019; Weil, 2005).

Employment adjustment is the most widely studied channel of minimum wage transmission. The effect of minimum wages on employment is a contentious topic among empirical economists. As predicted by monopsony and search models, some studies show evidence of an increase in employment following an increase in minimum wages. Although Levin-Waldman and McCarthy (1998) find that minimum wages do not result in job destruction, they present evidence of increased unemployment through hindrances on job creation. However, many of the studies report that minimum wages have a negative effect on the employment of low skilled workers (Neumark and Washer, 2006; Neumark et al., 2014). Moreover, a few studies find that minimum wages have no significant effect on employment.

The evidence of price pass-through is presented by Wadsworth (2010) who observed a relatively faster and more significant increase in prices of goods produced in minimum wage intensive sectors. Harasztsosi and Lindner (2019) also investigated price effects of minimum wages and reported a substantial pass-through of around 75%. Furthermore, in line with the competitive model predictions, the pass-through was lower in tradeable than non-tradeable sectors. Several other studies support the positive effect of minimum wages on inflation (Card and Krueger, 1995; Macdonald and Aaronson, 2000; Hirsch et al., 2015; Huang et al., 2014).

While older studies find that minimum wage increases do not significantly affect productivity (e.g., Acemoglu and Pischke 2003; Grossberg and Sicilian 1999; Neumark and Wascher 2001), more recent studies present positive minimum wage effects on training and productivity. For instance, Hirsch et al. (2015) find that minimum wages enhance productivity through the introduction of tighter working schedules and increased investment in employee training. Similarly, Riley and Bondebene (2015) report that the UK minimum wage increased labour productivity through an increase in the total factor productivity - a finding consistent with the institutional model of the labour market.

If firms fail to use any channel of adjustment in response to minimum wage increase, increased labour costs lead to reduced revenues and profits. However, empirical evidence on the effect of minimum wages on profits is scarce. Draca, Machin and van Reenen (2011) found that firms largely absorbed the newly introduced National minimum wage in the United Kingdom (UK) through reduced profits. The profit effects on minimum wage legislation have implications for firm survival and exit. A negative impact of minimum wages on revenue and profit increases firm exit (Luca and Luca, 2019).

4. Empirical strategy

To estimate the impact of the minimum wage hike on farms, we compare the evolution of key variables between our treatment and control firms. We closely follow Harasztsosi and Lindner (2019) to estimate the difference-in-differences framework in the form:

$$\frac{y_{it} - y_{i2013}}{y_{i2013}} = \alpha_t + \beta_t FA + \gamma X_{it} + \varepsilon_{it} \qquad (1)$$

Where y_{it} is the outcome variable of interest for firm i at time t, FA is the fraction of affected workers and X represents the firm-level controls (i.e. firm-size, foreign ownership status, TFP, capital-labour ratio[6]) and ε_{it} is the error term. We also control for three-digit industry classification and provincial rainfall. The dependent variable in Equation 1 is the percentage change in the outcome variable between 2013 (i.e. the last year before the minimum increase) and year t. The parameter β measures the impact of the minimum wage hike on the dependent variable. In this setup, time effects and firm characteristics vary flexibly over time (Harasztsosi and Lindner, 2019).

Total factor productivity (TFP) - our measure of firm productivity, is the residual of a Cobb-Doulas production function. We estimate the production function using the Ordinary Least Square (OLS)

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[6] We use pre-policy means of TFP and capital-labour ratio as controls in the regression.

technique. TFP is a driver of output growth and it measures unquantifiable factors such as technology and managerial efficiency. An increase in TFP is an indicator of increased efficiency.

5. Data and variables

We use South Africa's administrative tax data to study the firm-level effects of the minimum wage hike. The key variables from the Corporate Income Tax (CIT) data include labour costs, sales revenue, cost of sale and expenditure on physical capital (property, plant, and equipment). We source information on employees from the job-level IRP5 dataset. The IRP5 dataset contains detailed information on the employees' income and total work periods. We collapse the job-level dataset to individual-level data by keeping the job with the highest income for each individual. At the individual level, we identify minimum wage workers and then calculate the number of employees and the proportion of minimum wage worker in each firm. We then collapse the dataset to create an IRP5 firm-level dataset.

We restrict the dataset to the relevant sub-sectors within the agriculture industry. These subsectors include: (i) Growing of non-perennial crops, (ii) Growing of perennial crops, (iii) Plant propagation, (iv) Animal production, and (v) Mixed farming. The geographical unit in the analysis data is the province, which allows us to add provincial rainfall data from the South African Weather Service. Our analysis dataset contains a population of 4,057 farms and covers the tax years 2010/2011 to 2016/2017. The descriptive statistics of the key variables are shown in Table 1 below.

Table 1:Descriptive statistics

Tax year	Employment	Revenue	cost of sales	capital	labour cost
2010/2011	149	520,581	342,719	168,377	49,752
	(669)	(4,009,375)	(2,812,497)	(924,074)	(420,600)
2011/2012	158	488,119	315,690	161,530	50,176
	(656)	(3,146,886)	(2,110,485)	(814,862)	(387,827)
2012/2013	134	502,989	331,092	159,326	48,415
	(513)	(3,622,411)	(2,641,263)	(835,495)	(383,292)
2013/2014	141	556,576	357,847	174,997	53,479
	(526)	(3,949,576)	(2,855,924)	(867,954)	(401,847)
2014/2015	150	584,236	367,163	186,982	57,481
	(571)	(4,096,181)	(2,940,464)	(902,084)	(420,400)
2015/2016	160	639,726	417,207	209,564	60,161
	(604)	(4,670,288)	(3,405,370)	(1,050,552)	(467,958)
2016/2017	175	661,346	432,496	216,809	62,809
	(677)	(4,663,351)	(3,321,950)	(940,698)	(480,224)

Notes: Table 1 shows the average and standard deviations of employment (employee head count), revenue, material (cost of sales), capital and labour cost. Revenue, cost of sales, capital and labour cost are expressed in R10,000 of South African Rands (ZAR).

6. Results and Discussion

This section presents the regression results obtained from running Equation 1. The regression tables associated with the coefficient plots presented in this section are in Appendix C. The coefficient plots in Figure 1 show the effects of the minimum wage hike on total labour cost and labour cost per employee. Panels (a) and (b) show that the minimum wage legislation increased the labour costs of the low-wage farms (i.e. the target farms). In appendix A, we show that an increase in wages drove the increase in labour costs. Therefore, the labour costs outcome conveys that the minimum wage increase was binding and that there was some compliance among the farms in our analysis sample.
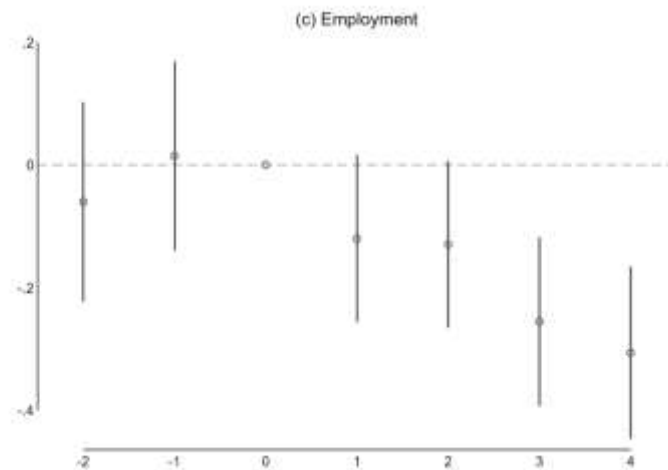
Figure 1: Effect of the minimum wage hike on total labour cost and labour cost per employee
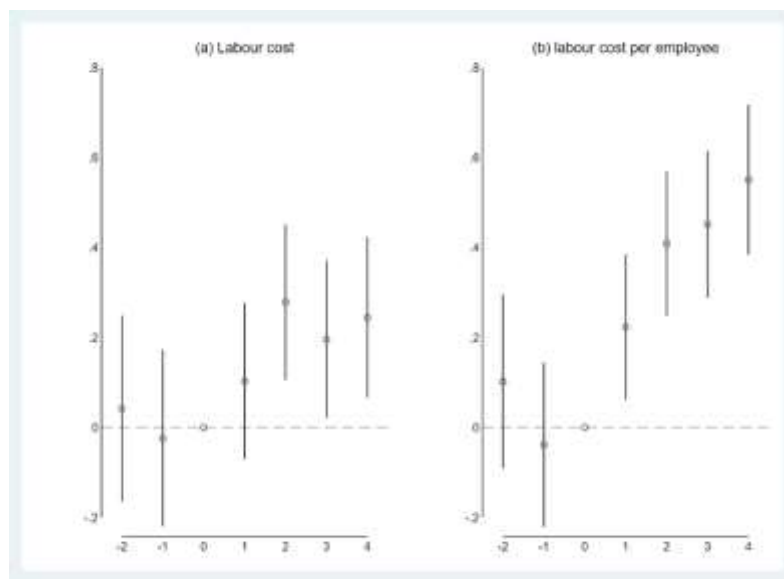
Source: Authors computations from own datasets based on National Treasury and UNU-WIDER (2021)

The results in Figure 1 relate to the suitability of our dataset in the investigation of the minimum wages adjustment channel. The low-wage farms in the sample experienced increased labour costs following the minimum wage increase, so we can observe how other margins shifted in response to minimum wage induces costs. In Figure 2, we present the employment effects of the minimum wage legislation. We find no evidence of pre-policy trends and observe a decrease in employment. Panel (c) on Figure 2 shows that employment decreased gradually, with the impact being larger and more statistically significant in the long run.

Figure 2: Effect of the minimum wage hike on employment

(c) Employment

Source: Authors computations from own datasets based on National Treasury and UNU-WIDER (2021)

The results in Figure 2 show the evidence of the employment channel of minimum wage adjustment. Low-wage farms internalised the additional costs by reducing their demand for labour, a finding consistent with the neoclassical prediction of minimum wage effects. However, this outcome does not provide conclusive evidence that employers in the agricultural sector face perfect competition, as we can obtain a similar result in a monopsonistically competitive labour market facing a sufficiently large minimum wage increase.

Figure 3 shows evidence of the capital intensity channel of minimum wage adjustment. Panel (d) illustrates the evolution of capital intensity when we do not control for pre-policy levels of capital intensity, whereas Panel (e) shows the results obtained after controlling for pre-policy capital levels. We observe no policy effects in Panel (d) but a gradual increase in capital intensity in Panel (e) with no evidence of pre-policy trends. Here, the Panel (d) results illustrate a general persistence in capital intensity. Low-capital farms remained low-capital farms, and high-capital farms remained high-capital farms after the minimum wage hike. Controlling for pre-policy capital allows us to observe a policy effect on capital intensity. According to Panel (e), low-capital low-wage farms experienced a rapid increase in capital accumulation compared to low-capital high-wage farms. Similarly, the capital intensity increased at a high rate for high-capital low-wage farms compared to high-capital high-wage farms.

Our results therefore show evidence of capital accumulation over time among low-wage farms following the minimum wage hike. The capital effect is more significant in the long run, the same period characterised by a substantial decline in employment. Therefore, our findings suggest that the

legislation led to capital-labour substitution and a shift towards more capital-intensive farms in the agricultural sector.

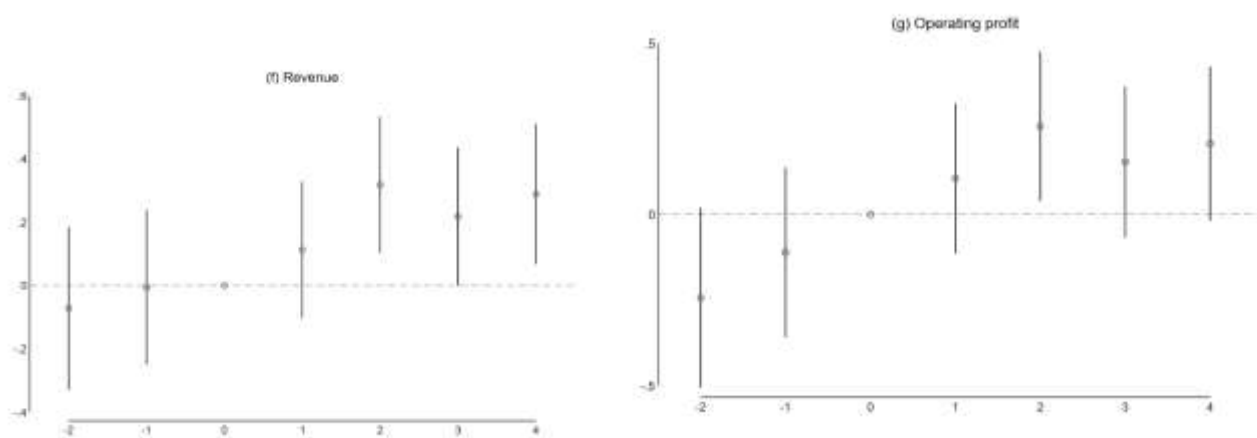Figure 3: Effect of the minimum wage hike on capital intensity
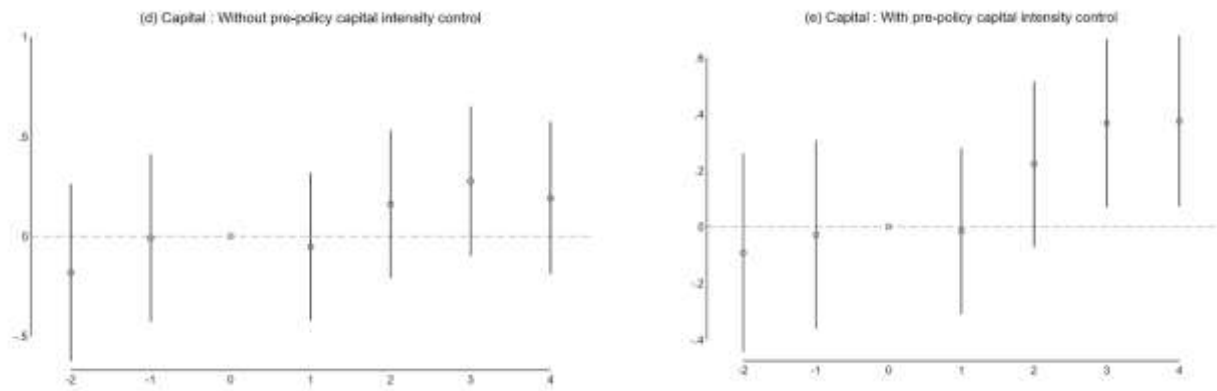
In Figure 4, we present the effect of a minimum wage hike on sales revenue and operating profit. We observe a significant increase in sales revenue, a positive effect on operating profit, and no significant effect on cost of goods sold (COGS) (see Appendix B).

Farms affected by the minimum wage increase are likely to be small scale farms with no price-setting power. Moreover, we expect firms in a tradeable sector like farming to be price takers, given the high elasticity of the produced goods. However, contrary to our expectations, the observed increase in revenues suggests evidence of the price pass-through of the minimum wage. In line with this finding, Tan (2021) uses data from the Department of Agriculture to show a sudden increase in crop prices in the period after the minimum wage hike. Therefore, a portion of the minimum hike was paid for by consumers through increases in crop prices.

Figure 4: Effect of the minimum wage hike on revenue and operating profit

Finally, Figure 5 shows the effect of the minimum wage hike on our efficiency measures, labour productivity and TFP. Panel (h) shows an increase in labour productivity, and Panel (i) shows an increase in TFP after the minimum wage hike. Our labour productivity measure is the operating profit per employee. The results show that affected farms experienced a rise in profits, with relatively fewer workers, after the minimum wage hike. In Appendix A, farms reporting employee training expenditures did not experience a significant increase in employee training after the minimum wage hike. So our results present no conclusive evidence that the observed increase in TFP is associated with an increase in managerial efficiency. The observed increase in TFP can thus be explained by the firm and employee composition effect. At the individual level, we can observe an increase if farms respond to a minimum wage hike by firing less productive workers, and at the firm level, we can observe an increase in efficiency if the minimum wage increase results in the exit of low productive farms.

Figure 5: Effect of the minimum wage hike of efficiency
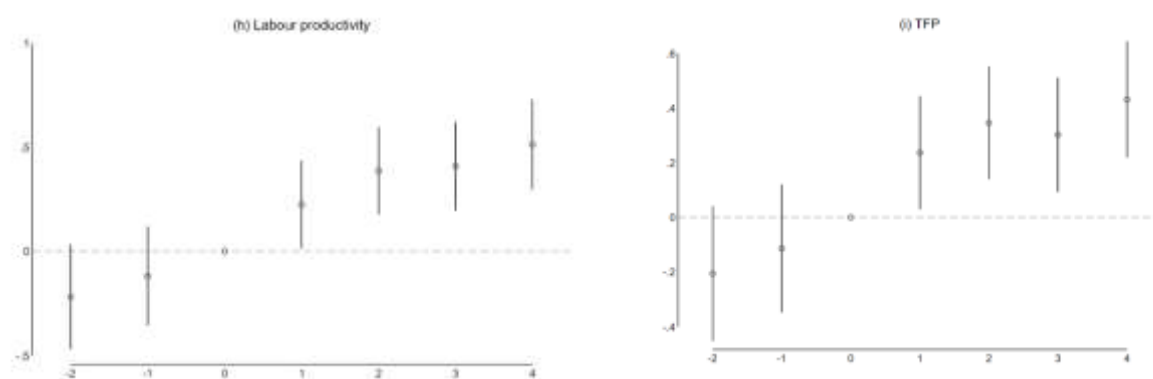
Source: Authors computations from own datasets based on National Treasury and UNU-WIDER (2021)

7. Conclusion

The researchers used rich administrative tax data to evaluate the effect of a significant increase in minimum wages in South Africa's farming sector. Our difference-in-differences results show an increase in labour costs among low-wage farms following the minimum wage hike. We present evidence of multiple adjustment channels employed by low-wage farms to internalise the minimum wage induced costs. Firstly, low-wage farms responded by gradually reducing employment over time. Secondly, we show evidence of capital-labour substitution to increase productivity and reduce the unit cost of production. Finally, our results suggest that affected farms passed on a portion of the minimum wage increase to consumers through an increase in crop prices. Furthermore, while we observe an increase in TFP after the minimum wage hike, we do not provide conclusive evidence to show that the observed increase in TFP is associated with an increase in managerial efficiency.

References

Arulampalam, W., Booth, A. and Bryan, L. (2004). 'Training and the NewMinimum Wage'. Economic Journal 114(494): C87–C94.

Boal, W. M., & Ransom, M. R. (1997). Monopsony in the labor market. *Journal of economic literature*, *35*(1), 86-112.

Bodnár, K., Fadejeva, L., Iordache, S., Malk, L., Paskaleva, D., Pesliakaitė, J., ... & Wyszyński, R. (2018). How do firms adjust to rises in the minimum wage? Survey evidence from Central and Eastern Europe. *IZA Journal of Labor Policy*, *7*(1), 1-30.

Bodnár, K., Fadejeva, L., Iordache, S., Malk, L., Paskaleva, D., Pesliakaitė, J., ... & Wyszyński, R. (2018). How do firms adjust to rises in the minimum wage? Survey evidence from Central and Eastern Europe. *IZA Journal of Labor Policy*, *7*(1), 1-30

Draca, M., Machin, S., and Van Reenen, J. (2005). The Impact of the National Minimum Wage on Profits and Prices, Research Report for the Low Pay Commission.

Draca, M., Machin, S., and Van Reenen, J. (2011). 'Minimum Wages and Firm Profitability'. American Economic Journal: Applied Economics, 3, 129-151.

Galindo-Rueda, F. and Pereira, S. (2004). The Impact of the National Minimum Wage on British Firms, Research Report for the Low Pay Commission

Garita, J. (2020). Minimum Wages and Firm Dynamics: Evidence From Costa Rica's Occupation-Based System. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3727791

Georgiadis, A. (2013). 'Efficiency Wages and the Economic Effects of the

Hall D, Cooper D (2012) How raising the federal minimum wage would help working families and give the economy a boost, issue brief no. 341. Economic Policy Institute, Washington, DC.

Harasztosi, P., & Lindner, A. (2019). Who Pays for the Minimum Wage? *American Economic Review*, *109*(8), 2693–2727. https://doi.org/10.1257/aer.20171445

Hirsch, B. T., Kaufman, B. E., & Zelenska, T. (2015). Minimum wage channels of adjustment. *Industrial Relations: A Journal of Economy and Society*, *54*(2), 199-239.

Hirsch, B., Kaufman, B. and Zelenska, T. (2015). Minimum Wage Channels of Adjustment, IZA Discussion paper n. 6132.

Huang, Y., Loungani, M. P., & Wang, G. (2014). *Minimum wages and firm employment: Evidence from China*. International Monetary Fund

Huang, Y., P. Loungani, G. Wang (2014), Minimum wages and firm employment: evidence from China. IMF Working Papers, 2014/184, October 2014

Kaufman, B. E. (2010). Institutional economics and the minimum wage: broadening the theoretical and policy debate. *ILR Review*, *63*(3), 427-453.

Lester, R. A. (1960). Employment effects of minimum wages. *ILR Review*, *13*(2), 254-264.

Liebenberg, F. (2013). *South African agricultural production, productivity and research performance in the 20th century* (Doctoral dissertation, University of Pretoria).

Minimum Wage: Evidence from a Low-Wage Labour Market'. Oxford Bulletin of Economics and Statistics, 75(6): 972-979.

Neumark D, Salas J. M I, Wascher W (2014) Revisiting the minimum wage–employment debate: throwing out the baby with the bathwater? Industr Labor Relat Rev 67(3_suppl):608–648

Neumark, D., & Wascher, W. (2006). Minimum wages and employment: A review of evidence from the new minimum wage research.

Neumark, D., Salas, J. I., & Wascher, W. (2014). Revisiting the minimum wage—Employment debate: Throwing out the baby with the bathwater? *Ilr Review*, *67*(3_suppl), 608-648

Owens, F. and Kagel, J. (2010). 'Minimum Wage Restrictions and Employee

Piek, M., von Fintel, D., & Kirsten, J. (2020). Separating employment effects into job destruction and job creation.

Ranchod, V., & Bassier, I. (2017). *Estimating the wage and employment effects of a large increase in South Africa's agricultural minimum wage*. REDI3x3 Working Paper.

Riley, R. and Rosazza Bondibene, C. (2015) The Impact of the National Minimum Wage on UK Businesses, Research Report for the Low Pay Commission. Rizov,

Schmitt, J. (2013). *Why does the minimum wage have no discernible effect on employment?* (Vol. 4). Washington, DC: Center for Economic and Policy Research.

Tan, B. (2021). The minimum wage and firm networks: Evidence from South Africa. *Available at SSRN 3848902*.

Van der Zee, K. (2017). *Assessing the effects of two agricultural minimum wage shocks in South Africa* (Master's thesis, University of Cape Town).

Wilson, Mark. "The negative effects of minimum wage laws." *CATO Institute Policy Analysis* 701 (2012).

Appendix A: Labour costs

Our labour cost variable is an aggregation of all employee expenses. However, the tax return form (ITR14) specifies different employee expense fields for different company types. Medium to large firms report more employee expenses compared to other company types. The fields available for medium to large firms include wages and salaries, group life insurance, UIF contributions and SDL, pensions and provident fund contributions, medical scheme contributions, membership of a professional body and training expenses. Small businesses report total salaries and wages (including, pension and provident fund contribution) and micro firms only report salaries and wages.

The IRP5 data allows us to calculate each firm's total wages. To test if the minimum wage increase affected the non-wage component of labour cost, we created a non-wage labour cost variable by subtracting total wages from labour cost. Figure 5 and Table 2 shows difference-in-differences estimates of total wages, total non-wage labour cost, training expenses and total labour cost. While total wages significantly increased after the minimum wage increase, we did not observe significant changes in total non-wage labour costs and training costs. The results therefore suggest that the observed increase in total labour costs was driven by the increase in total wages after the minimum wage increase.

Figure 6 : Regression coefficients obtained by estimating Equation 1 with wages, non-wage labour costs, employee training and total labour cost as outcome variables
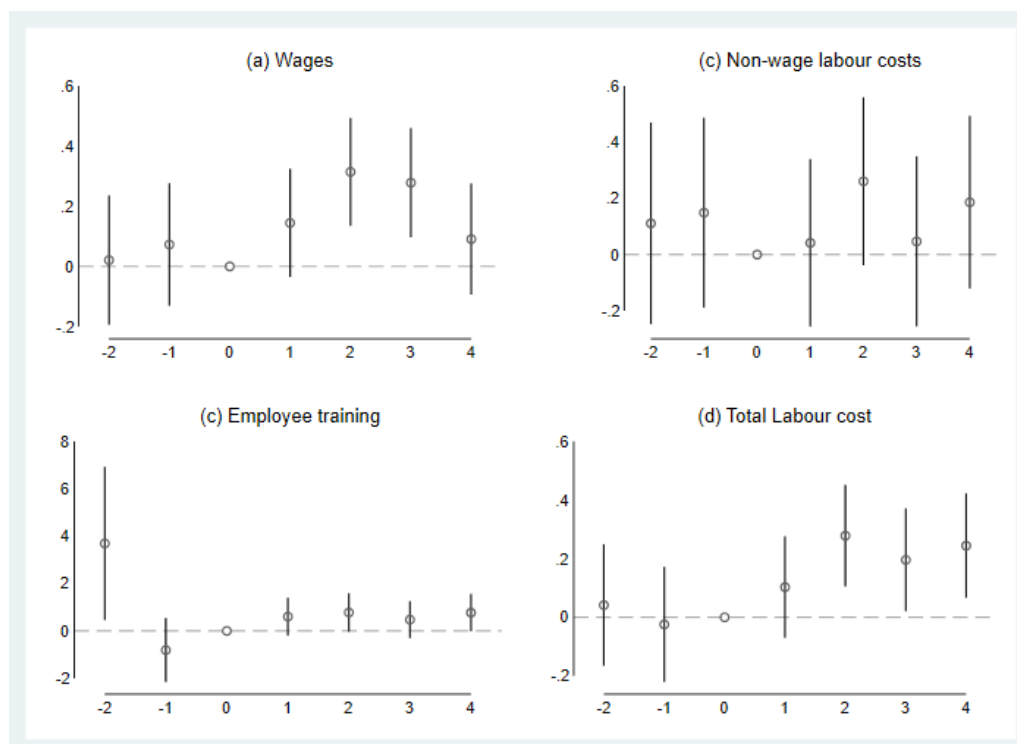
Source: Authors computations from own datasets based on National Treasury and UNU-WIDER (2021)

Table 2: Regression coefficients obtained by estimating Equation 1 with wages, non-wage labour costs, employee training and total labour cost as outcome variables

	Wages	Wages	Non-wage labour cost	Non-wage labour cost	Training	Training	Labour cost	Labour cost
fa*2011	0.187	0.021	0.322*	0.111	2.521*	3.691**	0.274**	0.042
	(0.139)	(0.110)	(0.179)	(0.183)	(1.426)	(1.648)	(0.122)	(0.106)
fa*2012	0.190	0.073	0.208	0.149	-0.713	-0.807	0.187	-0.024
	(0.138)	(0.104)	(0.179)	(0.172)	(0.646)	(0.688)	(0.122)	(0.100)
fa*2013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
fa*2014	0.135	0.145	0.090	0.042	0.501	0.601	0.131	0.103
	(0.135)	(0.092)	(0.175)	(0.152)	(0.434)	(0.409)	(0.119)	(0.088)
fa*2015	0.198	0.314***	0.203	0.261*	0.809*	0.776*	0.213*	0.278***
	(0.135)	(0.092)	(0.175)	(0.152)	(0.438)	(0.414)	(0.119)	(0.088)
fa*2016	0.164	0.278***	0.050	0.047	0.504	0.474	0.148	0.196**
	(0.137)	(0.093)	(0.177)	(0.154)	(0.420)	(0.397)	(0.120)	(0.089)
fa*2017	-0.073	0.091	0.167	0.186	0.602	0.770*	0.158	0.244***
	(0.139)	(0.094)	(0.180)	(0.157)	(0.424)	(0.403)	(0.123)	(0.091)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	15670	14378	12926	11832	2158	2111	15704	14408
R squared	0.05	0.57	0.01	0.29	0.01	0.16	0.01	0.48

Source: Authors computations from own datasets based on National Treasury and UNU-WIDER (2021)

Appendix B: Cost of goods sold (COGS)

All firms report the COGS on the ITR14 form. This field captures the operating expenses related to the production of goods and services. COGS includes labour costs and materials used in production. To test if farmers resorted to using cheaper materials in response to the minimum wage increase, we created the "materials" variable by subtracting total wages from COGS. Figure 6 and Table 3 show the difference-in-differences coefficients of COGS and materials. We find no evidence of significant changes in material costs. Like total labour costs, the results show that the increase in COGS was driven by the increase in total wages after the minimum wage increase.

Figure 7: Regression coefficients obtained by estimating Equation 1 with COGS and materials as outcome variables
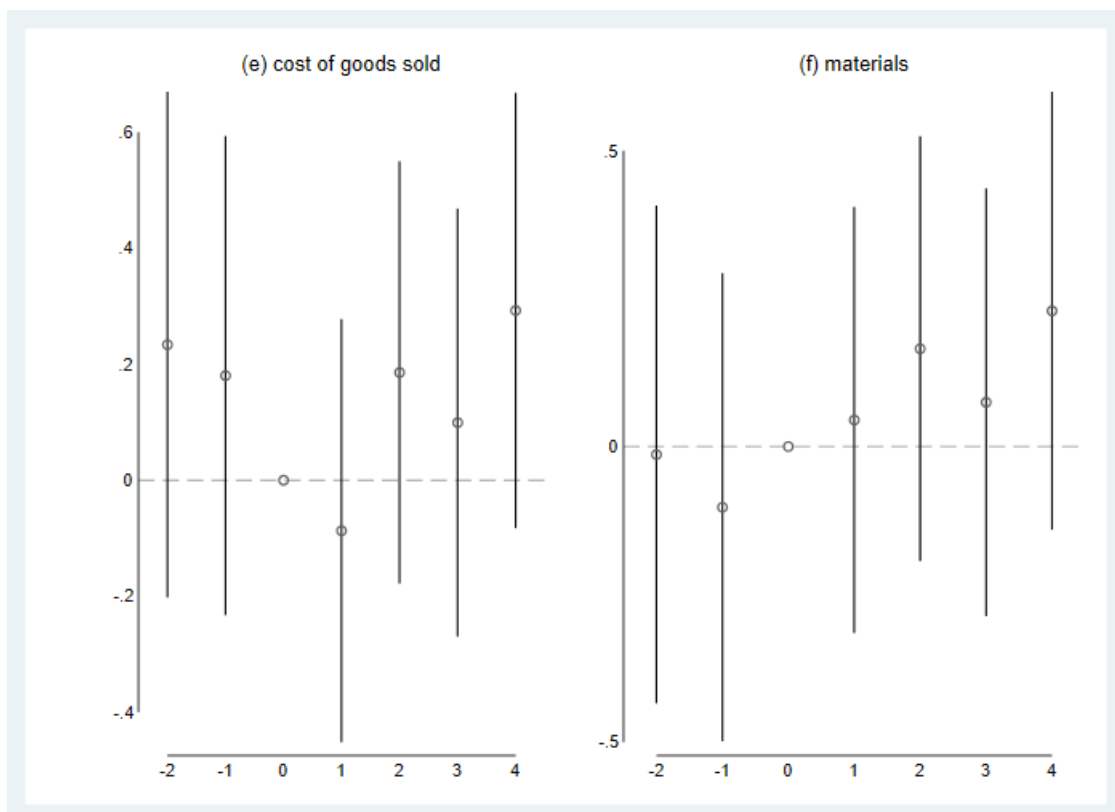
Source: Authors computations from own datasets based on National Treasury and UNU-WIDER (2021)

Table 3: Regression coefficients obtained by estimating Equation 1 with COGS and materials as outcome variables

	COGS	COGS	Material	Material
fa*2011	0.526**	0.234	0.340	-0.014
	(0.221)	(0.222)	(0.221)	(0.215)
fa*2012	0.492**	0.180	-0.054	-0.103
	(0.221)	(0.211)	(0.220)	(0.202)
fa*2013	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
fa*2014	0.021	-0.087	0.071	0.045
	(0.216)	(0.186)	(0.220)	(0.184)
fa*2015	0.204	0.186	0.151	0.165
	(0.216)	(0.186)	(0.219)	(0.183)
fa*2016	0.146	0.099	0.140	0.075
	(0.219)	(0.188)	(0.221)	(0.184)
fa*2017	0.258	0.293	0.151	0.229
	(0.223)	(0.191)	(0.227)	(0.189)
Controls	No	Yes	No	Yes
Observations	15704	14408	11381	10505
R squared	0.00	0.29	0.00	0.33

Source: Authors computations from own datasets based on National Treasury and UNU-WIDER (2021)

Appendix C: Regression tables

Table 4: Regression coefficients obtained by estimating Equation 1 on key outcome variables; labour cost, employment, COGS, revenue, operating profits, and labour productivity

	labour cost	labour cost	Employment	Employment	COGS	COGS	Revenue	Revenue	Operating profits	Operating profits	labour productivity	labour productivity
fa*2011	0.274**	0.042	-0.255*	-0.060	0.526**	0.234	0.260*	-0.072	0.110	-0.243*	0.358***	-0.219*
	(0.122)	(0.106)	(0.139)	(0.083)	(0.221)	(0.222)	(0.148)	(0.132)	(0.147)	(0.134)	(0.122)	(0.128)
fa*2012	0.187	-0.024	-0.073	0.015	0.492**	0.180	0.246*	-0.006	0.151	-0.111	0.225*	-0.119
	(0.122)	(0.100)	(0.139)	(0.079)	(0.221)	(0.211)	(0.148)	(0.125)	(0.146)	(0.127)	(0.122)	(0.121)
fa*2013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
fa*2014	0.131	0.103	-0.201	-0.120*	0.021	-0.087	0.148	0.113	0.155	0.105	0.357***	0.225**
	(0.119)	(0.088)	(0.136)	(0.070)	(0.216)	(0.186)	(0.145)	(0.110)	(0.143)	(0.112)	(0.120)	(0.107)
fa*2015	0.213*	0.278***	-0.336**	-0.130*	0.204	0.186	0.242*	0.318***	0.192	0.257**	0.528***	0.387***
	(0.119)	(0.088)	(0.136)	(0.069)	(0.216)	(0.186)	(0.144)	(0.110)	(0.142)	(0.111)	(0.119)	(0.107)
fa*2016	0.148	0.196**	-0.470***	-0.255***	0.146	0.099	0.164	0.217*	0.120	0.154	0.590***	0.409***
	(0.120)	(0.089)	(0.138)	(0.070)	(0.219)	(0.188)	(0.146)	(0.111)	(0.144)	(0.113)	(0.121)	(0.108)
fa*2017	0.158	0.244***	-0.575***	-0.306***	0.258	0.293	0.198	0.289**	0.159	0.207*	0.734***	0.513***
	(0.123)	(0.091)	(0.140)	(0.072)	(0.223)	(0.191)	(0.149)	(0.113)	(0.147)	(0.115)	(0.123)	(0.110)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	15704	14408	15704	14408	15704	14408	15704	14408	15668	14387	15704	14408
R squared	0.01	0.48	0.10	0.77	0.00	0.29	0.01	0.44	0.01	0.41	0.08	0.28

Source: Authors computations from own datasets based on National Treasury and UNU-WIDER (2021)

Table 5: Regression coefficients obtained by estimating Equation 1 with capital and TFP as outcome variables

	Capital	Capital	Capital	TFP	TFP	TFP
fa*2011	-0.017	-0.092	-0.182	0.237**	-0.233**	-0.206
	(0.209)	(0.180)	(0.226)	(0.109)	(0.113)	(0.126)
fa*2012	0.100	-0.029	-0.009	0.173	-0.107	-0.114
	(0.209)	(0.170)	(0.214)	(0.109)	(0.107)	(0.119)
fa*2013	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)
fa*2014	-0.037	-0.015	-0.053	0.265**	0.169*	0.236**
	(0.205)	(0.150)	(0.189)	(0.107)	(0.094)	(0.106)
fa*2015	0.077	0.222	0.161	0.352***	0.287***	0.345***
	(0.204)	(0.150)	(0.189)	(0.106)	(0.094)	(0.105)
fa*2016	0.231	0.367**	0.276	0.324***	0.224**	0.302***
	(0.207)	(0.152)	(0.191)	(0.108)	(0.095)	(0.107)
fa*2017	0.079	0.375**	0.191	0.443***	0.302***	0.431***
	(0.211)	(0.155)	(0.195)	(0.110)	(0.097)	(0.109)
Controls	No	Yes	Yes	No	Yes	Yes
Pre-policy capital intensity	No	Yes	No	No	Yes	Yes
Pre-policy TFP	No	Yes	Yes	No	Yes	No
Observations	15704	14408	14408	15704	14408	14408
R squared	0.01	0.49	0.20	0.03	0.26	0.07

Source: Authors computations from own datasets based on National Treasury and UNU-WIDER (2021)