SA-TIED
Southern Africa – Towards Inclusive Economic Development

WORKING PAPER 249

Minimum wages, de facto private standards, and trade diversion in horticulture

Marlies Piek[1] and Dieter von Fintel[2]

March 2025

UNU WIDER
national treasury
Department: National Treasury
REPUBLIC OF SOUTH AFRICA
SARS
Co-funded by the European Union
British High Commission Pretoria

About the project

Southern Africa – Towards Inclusive Economic Development (SA-TIED)

SA-TIED is a unique collaboration between local and international research institutes and the government of South Africa. Its primary goal is to improve the interface between research and policy by producing cutting-edge research for inclusive growth and economic transformation in the southern African region. It is hoped that the SA-TIED programme will lead to greater institutional and individual capacities, improve database management and data analysis, and provide research outputs that assist in the formulation of evidence-based economic policy.

The collaboration is between the United Nations University World Institute for Development Economics Research (UNU-WIDER), theNational Treasury of South Africa, the South African Revenue Services, and other universities and institutes. It is funded by the National Treasury of South Africa, the Delegation of the European Union to South Africa and UNU-WIDER through the Institute's contributions from Finland, Sweden, and the United Kingdom to its research programme.

[1]National Treasury of the Republic of South Africa, Pretoria and Department of Economics at Stellenbosch University, Stellenbosch, South Africa marlies.piek@treasury.gov.za;
[2]Department of Economics at Stellenbosch University, Stellenbosch, South Africa and Institute of Labor Economics (IZA), Bonn, Germany.

WIDER Working Paper 2025/10

Minimum wages, de facto private standards, and trade diversion in horticulture

Marlies Piek[1] and Dieter von Fintel[2]

March 2025

United Nations University World Institute for Development Economics Research

wider.unu.edu

Abstract: The effects of minimum wages on workers and firms depend on enforcement and compliance. While most research examines local determinants, this paper explores whether international market enforcement influences minimum wage impacts. In South Africa farmers exporting to the EU must comply with private standards mandating minimum wage adherence. Using difference-in-differences and administrative tax data, we analyse how a large agricultural minimum wage increase affected export stance, employment, and wages under varying private standards. Farmers did not exit export markets, but those with the EU as a secondary market temporarily diverted trade, raised wages, and maintained employment. In contrast, farmers primarily exporting to the EU increased wages more aggressively to comply but temporarily slowed employment growth. These findings suggest that international private standards play a key role in enforcing minimum wages and shaping firms' wage and employment decisions.

Key words: minimum wages, private standards, trade diversion, employment, wages, administrative tax data, South Africa

JEL classification: J38, K42, F14, L15

Acknowledgements: Marlies gratefully acknowledges funding for her doctoral studies from the National Research Foundation of South Africa (grant numbers 113611 and 116400) and RESEP. Any opinion, finding, conclusion, or recommendation is those of the authors and does not necessarily reflect the opinions of the funders or the authors' affiliated institutions

[1]National Treasury of the Republic of South Africa, Pretoria and Department of Economics at Stellenbosch University, Stellenbosch, South Africa marlies.piek@treasury.gov.za; [2]Department of Economics at Stellenbosch University, Stellenbosch, South Africa and Institute of Labor Economics (IZA), Bonn, Germany.

This study has been prepared within the UNU-WIDER project Southern Africa—Towards Inclusive Economic Development (SA-TIED).

Information and requests: publications@wider.unu.edu

ISSN 1798-7237 ISBN 978-92-9267-567-7

https://doi.org/10.35188/UNU-WIDER/2025/567-7

Typescript prepared by Lesley Ellen.

United Nations University World Institute for Development Economics Research provides economic analysis and policy advice with the aim of promoting sustainable and equitable development. The Institute began operations in 1985 in Helsinki, Finland, as the first research and training centre of the United Nations University. Today it is a unique blend of think tank, research institute, and UN agency—providing a range of services from policy advice to governments as well as freely available original research.

The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland and Sweden, as well as earmarked contributions for specific projects from a variety of donors.

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

Producers have multiple available choices to adjust to minimum wage increases. The most studied response is their changes to labour demand (hours worked, worker composition, size of workforce, inter alia), but firms can also change their investment strategy (such as investing in more capital), increase prices to transfer the higher wage cost to consumers, face reduced profits, increase total factor productivity, or exit the market, inter alia (Brown et al. 1982; Card and Kruger 1994; Hau et al. 2020; Hirsch et al. 2015; MaCurdy 2015; Mayneris et al. 2018; Neumark and Wascher 2000). A further strategy documented mainly in the developing country literature is non-compliance with legislation (Bhorat et al. 2017). We hypothesize that another adjustment mechanism exists that is unique to exporters and which, to the best of our knowledge, has not been studied before. Firms that export to countries that require adherence to voluntary but de facto private standards—including compliance with local labour laws in the exporter's country—face the decision of whether to continue exporting or selling their output exclusively to the local market. Firms that do continue to export could, additionally, divert trade to countries that impose less stringent requirements on exporters. Diverting trade to markets with lower (or no) private standards increases the scope for non-compliance with minimum wage legislation, possibilities that are put in focus by this paper.[1]

While the literature on the role and impacts of private standards is vast, gaps remain. Some of the most researched topics within the private standards literature include their impact on working conditions and international trade, though no studies have studied how minimum wage legislation mediates the link between private standards and these outcomes. Research has shown that workers from certified firms benefit from higher wages, increased job security, improved health, and improved welfare more generally (Colen et al. 2012; Ehlert et al. 2014; Levine and Toffel 2010; Maertens and Swinnen 2009; Ortiz and Aparicio 2007; Trifković 2017). However, contradicting views on the role of private standards and international trade exist—while some argue that private standards act as barriers to trade (Maertens and Swinnen 2012), some argue that they facilitate international trade (Jaffee 2005). However, to our knowledge, no research has looked at how private standards interact with minimum wage legislative changes to change working conditions or exporting behaviour and this is the focus of this study.

We use micro-level administrative export records and employee income tax certificates to study the responses of exporting horticultural farmers in South Africa in response to a large increase in agricultural minimum wages in 2013. We focus on farmers who primarily export fresh fruit and vegetables as trade in these products is among the most affected by private standards (Garcia et al. 2004; Unnevehr 2000; World Trade Organization 2009). Adherence to private standards, in particular GLOBALG.A.P.,[2] has become de facto obligatory for farmers who want to access markets such as the European Union (EU) (Hobbs 2003; Ministry of Foreign Affairs of the

[1] A private standard is a set of principles designed and owned by a non-governmental entity that formalizes requirements about a production process and its products. An entity may opt to comply with private standards and obtain certification to prove that it has adhered to the requirements set out in the standard. It is common that private standards meet (and in certain areas, go beyond) the regulations of most countries so that becoming certified against a private standard is sufficient to access major export markets (Darroch 2010; Du 2018; Maertens and Swinnen 2009). In fact, for those producers who would like to access certain major foreign markets in certain sectors such as agriculture, it has become de facto obligatory to adhere to private standards and be certified (Henson and Hooker 2001; Henson and Northen 1998; Trifković 2017).

[2] G.A.P. stands for Good Agricultural Practices.

Netherlands 2014, 2024). During our period of analysis most private standards regulated production methods and product requirements, but they also required that producers comply with national and international laws, including labour laws (Trifković 2017). When faced with minimum wage shocks, farmers that export to countries that require private standard certification will be forced to comply with minimum wage legislation or potentially lose certification that allows them to access particular international markets. We identify firms' export destinations and link that to auxiliary information about market access restrictions in those markets to estimate the effect of private standards on trade patterns, employment, wages, and proportion of the year worked in response to a minimum wage shock. We hypothesize that if exporting farmers' responses to the minimum wage hike differ by export destination, it is likely driven by the private standards that were required.

We explore these questions in the context of the 2013 agricultural minimum wage hike in South Africa, a country that traditionally exports large amounts of horticultural products to the EU. While the minimum wage hike did not change the odds of farmers exporting, we find that it resulted in some trade diversion primarily among farmers who exported large shares of fresh fruit and vegetables. Specifically, exporting farmers for whom the EU is not their main trading partner diverted trade away from the EU for two years. In contrast farmers whose main export destination was the EU did not divert trade elsewhere. Farmers who diverted trade away from the EU raised wages to a lesser extent than farmers that did not, but they were able to keep employment growth unchanged. Low wage growth likely came at the expense of losing certification but without having to adjust employment. Conversely, farmers that primarily exported to the EU increased wages more aggressively to comply with the private standards. But they also experienced a temporary decline in employment growth in response to the minimum wage hike.

By the end of the analysis period, no trade diversion and no downward employment growth persisted. Trade diversion and employment were thus only used as a temporary adjustment mechanism until farmers could adjust to the new legislated minimum wage. The farmers who export to the EU—where GLOBALG.A.P. plays an important role in market access—seem to have faced a trade-off in the short run when faced with the minimum wage increase: either they had to divert trade to another region or increase wages in compliance with private standards but at the expense of slower employment growth. To the best of our knowledge, our results are the first to show that private standards that require labour law compliance influence export destinations in the wake of minimum wage shocks.

The rest of the paper is structured as follows. Section 2 discusses the relevant literature and identifies research gaps. Section 3 covers necessary background information for the paper—the agricultural minimum wage hike and what led to it and the role of private standards in the agricultural sector. Section 4 discusses the data, methodology, and limitations. Section 5 presents descriptive statistics. Section 6 presents the econometric results and Section 7 concludes the paper.

2 Literature

2.1 Private standards, international trade, firm behaviour, and worker welfare

Findings by Newman et al. (2018) show that involvement in international trade changes firms' behaviour towards greater social responsibility. The authors used a firm-level panel dataset of

Vietnamese businesses to assess how companies' corporate social responsibility (CSR)[3] activities—of which compliance with local labour legislation forms a large part—changed because of international trade. They found that, once firms started to export, their CSR activities increased by 15%. As exporting firms enter certain foreign markets, they encounter new stakeholders who may require them to act socially responsibly and thus increase their CSR involvement. However, the authors found that stakeholder preferences vary across the destination of exports. Firms that export to China engage in significantly less CSR activities than firms exporting to other destinations. In fact Adolph et al. (2017) found that labour standards in Africa decreased after increasing exports to China. Thus, depending on the destination of exports, international trade can enhance or worsen local firms' social responsibility behaviour.

The advantages of private standards certification (and quality assurance schemes more broadly) for firms are well established. These include price premiums from selling higher-quality products, reduced production costs, enhanced understanding of firms' quality systems—leading to improved operational performance—reduced quality and price variability, expanded market access, new customers, and improved competitiveness (Darroch 2010; Henson and Holt 2000; Turner et al. 2000; Yiridoe et al. 2003; Zaibet and Bredahl 1997). Additionally, Reardon and Farina (2002) and Henson and Reardon (2005) highlight benefits such as reputational competitive advantages. Hobbs (2003) further demonstrates that improved farm management practices required by EUREPG.A.P. can increase yields and revenue.[4] For example, soil mapping is required by private standards organizations. The goal is to maintain or improve soil fertility to boost production. Advancements in post-harvest storage and handling are required to reduce crop losses and damage. Moreover, Hobbs (2003) notes that the competitive pressure from EU food safety standards has significantly enhanced the cost competitiveness of Kenya's fresh vegetable sector. Another key benefit of adopting private food standards is that compliance builds consumer confidence in the brand, reducing market risk across the supply chain (Henson and Reardon 2005; Krieger and Schiefer 2005).

Benefits from being certified by a private standards organization do not only accrue to firms but also to their employees. Numerous researchers have shown that workers from certified firms benefit from higher wages, increased job security (through formal contracts and longer employment), improved health, and improved welfare more generally (Colen et al. 2012; Ehlert et al. 2014; Levine and Toffel 2010; Maertens and Swinnen 2009; Ortiz and Aparicio 2007; Trifković 2017). Trifković (2017) used a matched emplosyer–employee panel dataset to analyse the effect of private standards on employees in small and medium-sized enterprises in Vietnam. Employees in certified firms received higher wages and were more likely to have formal contracts than workers in non-certified firms. This occurred because the certified firms adhered to national labour laws and increased investment in employee training. Similarly, research by Colen et al. (2012) shows that wages and tenure increased for workers in firms in Senegal who were certified by GLOBALG.A.P. Employee benefits improved because of adherence to labour laws but also particularly through indirect effects such as increased profitability and investment in employee training.[5] Levine and Toffel (2010), who analysed firms in California, Ehlert et al. (2014), who

[3] CSR is a mixture of economic, legal, and ethical responsibilities of businesses (Schwartz and Carroll 2003).

[4] EUREPG.A.P. stands for the European Retailer Produce Working Group Good Agricultural Practices and is GLOBALG.A.P.'s predecessor.

[5] Employee training is a prerequisite for GLOBALG.A.P. certification. Workers must be taught how to adhere to processes, safety measures, hygiene standards, and so forth. This training increased skills, and therefore wages and tenure. The effect may operate through increased worker productivity or perhaps efficiency wages. A common shortfall of this literature is that the mechanism through which wages increase is not always clear. However,

studied Kenyan export vegetable farmworkers, and Ortiz and Aparicio (2007), who analysed Argentinean firms, likewise found that private standards increased wages and worker welfare in general.

2.2 Private standards and barriers to international trade

Private standards have faced criticism for limiting market access and serving as (non-tariff) trade barriers (Maertens and Swinnen 2012). Nonetheless, they have also played a role in facilitating international trade (Jaffee 2005) by forging links between consumer demands and global suppliers. Du (2018) suggests that private standards can be more effective in enhancing hygiene, safety, and processing than government programmes. This is due to the comprehensive requirements that private standards usually have for each stage of production and processing, resulting in more uniform farming, processing, and packaging practices (World Trade Organization 2009). Dolan and Humphrey (2000) found that certified farmers experienced long-term and substantial benefits from these trade relations. Jaffee and Henson (2004) observed that those who achieved certification against a private standard were able to maintain a consistent presence in major export markets, while those who did not were often displaced.

For firms that are not eligible for certification, private standards often act as barriers to trade. Reasons for being denied certification include insufficient financial resources to apply for certification, insufficient technical knowledge, or inability to comply with all the requirements set out by the private standards. A range of costs are associated with certification: firstly, the application costs of certification against specific standards and, secondly, implementation costs often including infrastructure upgrades and employee training, etc. (Thorstensen et al.2015). While some costs occur on a one-off basis, some are incurred annually. GLOBALG.A.P., for instance, requires an annual audit (GLOBALG.A.P. 2024). Darroch (2010) estimated that, on average, South African farmers that export citrus to the EU paid ZAR70,510 on initial compliance costs related to EUREPG.A.P. certification—GLOBALG.A.P.'s predecessor—while Vermeulen et al. (2006) estimated these costs to be ZAR130,000 for South African litchi and mango farmers. Often, the costs associated with being certified are too high for small-scale producers based in developing countries and exclude them from export value chains (Du 2018; Graffham et al. 2007; Jensen 2004; Okello 2005). While research has shown that there are price and revenue benefits (among others) to becoming certified, the initial sunk costs exclude many small-scale producers from becoming certified and certification is more readily accessible to larger farmers (Darroch 2010). Moreover, the development of private standards has been criticized for not being participatory and transparent. Stakeholders, often based in developing countries, who are often affected by the private standards are often not consulted (Fuchs et al. 2011).

2.3 Private standards literature in South Africa

Several studies have looked at the (perceived) benefits and costs of certification for farmers in South Africa (Breedt 2005; Burger 2002; Darroch 2010; Jooste et al. 2003; Mabiletsa 2003; Vermeulen et al. 2006; Wilson and Abiola 2004). An early study by Vermeulen et al. (2006) traced South African citrus exports and found that parallel standards exist—those on the farm and those in the supply chain. The study found that handling of the produce beyond the farm gate was not subjected to the same stringency as on the farm and led to lower fruit quality and financial losses for the farmers. To our knowledge, a more recent study on this matter has not been conducted in South Africa and thus we are uncertain of whether these issues have persisted since then.

irrespective of whether wages increase due to increased training, higher productivity, or employers paying efficiency wages, private standards play a role in shifting the pattern.

Additional papers that touch on private standards in the agricultural sector in South Africa exist but focus on matters beyond the scope of this paper (for instance, institutional arrangements to ensure small-scale farmers' integration into global markets, the need for better regulation in the organic certification process, etc.) include Bitzer et al. (2016), Freguin-Gresh and Anseeuw (2012), and Tung (2016).[6]

Together, there is substantial evidence that private standards benefit firms and workers in certified firms in developing countries. However, to the best of our knowledge, no study has analysed how private standards interact with minimum wage legislative changes to change working conditions or exporting behaviour, and this paper aims to shed light on this intersection.

2.4 Minimum wage literature

The impact of minimum wages on employment has been studied for decades and the evidence is mixed. Until the early 1990s the consensus was that a robust negative relationship between minimum wages and employment existed. This position was challenged by the results of Card (1992a, 1992b), Katz and Krueger (1992), and Machin and Manning (1994) (inter alia), signalling the emergence of the new minimum wage literature. Card and Krueger's (1994) seminal study analysed the increase in minimum wages in New Jersey and found—contrary to expectations—a very large positive effect on employment growth. On one side critics claim that the minimum wage harms low-skilled workers by causing job losses (e.g., Neumark and Wascher 2010; Stigler 1946). Conversely, supporters argue that the minimum wage does not significantly impact employment and can sometimes even have a positive effect (e.g., Card and Krueger 1995; Dube et al. 2010).

Neumark and Munguía Corella (2021) show that, when minimum wages are binding, where enforcement is higher, and when the studies focus on the formal sector and lower-wage workers—conditions under which minimum wages could deliver the most benefits—minimum wages more consistently result in employment losses in developing countries.

The minimum wage literature in South Africa mainly focuses on changes to employment. Bhorat et al. (2014) analysed the impact of agricultural minimum wages between 2000 and 2007. They found large job losses, while wages and hours worked increased following the introduction of minimum wages. In parallel work they showed that employment was not affected by minimum wages in other sectors (Bhorat et al. 2013). Piek et al. (2023) showed that non-seasonal agricultural employment growth decreased initially after the 2013 increase in the minimum wages, but employment growth recovered four years later. The slower employment growth was mainly driven by slower rates of worker entry.

Three additional papers are relevant to this study. Firstly, Piek and Von Fintel (2020) studied the employment effects of the introduction of minimum wages in a tradable (agriculture) and non-tradable (retail) sector in 2003. The study found that employment losses were only found in the agricultural sector and argued that this was in line with the idea that tradable sectors—those exposed to international markets—cannot push the higher wage costs onto the consumer by increasing prices. However, the data used in that paper was not suitable to attribute the measured effects to international trade directly. Secondly, Bassier and Ranchhod (2024) studied the effects of the large increase in agricultural minimum wages in 2013 on poverty and found no job losses. Bassier and Ranchhod (2024) used the Quarterly Labour Force Survey (QLFS) data from Statistics

[6] While not comparable to international private standards such as GLOBALG.A.P., some local retailers have placed requirements on farmers and their supply chain. Woolworths, for instance, focuses on sustainability throughout their supply chain (see Berning 2014 and Methner et al. 2015).

South Africa (StatsSA) for the years 2010–14, relying on 2012 wage data to determine the treatment intensity of the minimum wage increase in 2013. However, two studies (Kerr 2024; Kerr and Wittenberg 2021) show that earnings imputations in the publicly available QLFS data from 2010 are unreliable and lead to implausible trends. Additionally, Kerr (2024) compared earnings in administrative tax data with household surveys and found that household surveys under-report earnings, even at the lower end of the earnings distribution. This suggests that the proportion of individuals earning below the legislated minimum wage is likely overstated, which in turn overstates the treatment intensity variable used in the identification strategies of Bassier and Ranchhod (2024) and Van der Zee (2017). Thirdly, Tan (2021) was the first to study the effect of the 2013 increase in agricultural minimum wage on firm outcomes. The author found that industries with greater upstream exposure to the agricultural sector experienced decreases in assets, sales, and employment.

2.5 Minimum wage compliance and employment adjustments

Bhorat et al. (2017) and Rani et al. (2013) argue that the employment effects of minimum wage laws are dependent on the level of compliance with the law. In turn, compliance depends on the extent of enforcement of the law by authorities, but also in response to private standards. Research by Munguía Corella (2020) which considered 82 developing countries shows that minimum wages only decreased employment in countries with strong enforcement. Minor or no disemployment effects arose in countries with weak enforcement. Moreover, in a meta-data review, Neumark and Munguía Corella (2021) conclude that disemployment is widespread in countries with strong enforcement. South Africa's agricultural sector seems to be an anomaly: Bhorat et al. (2012) and Bhorat et al. (2021) show that 55% and 69% of farmworkers earned below the legislated minimum in 2007 and 2013, respectively.[7] Despite non-compliance and weak enforcement, employment losses have been documented in the sector following the introduction of agricultural minimum wages in 2003 and after the increase in 2013 (Bhorat et al. 2014; Piek and Von Fintel 2020; Piek et al. 2023). One potential explanation that could reconcile employment losses despite minimum wage violation is that the employment losses after the 2013 minimum wage increase were primarily driven by a decrease in new entrants as opposed to firing of existing workers as shown by Piek et al. (2023).[8]

However, most studies that consider enforcement as a determining factor in the minimum wage–employment relationship, do so using *local* enforcement measures (such as if and how non-compliance with labour regulation is penalized by the respective governments). This paper will analyse whether enforcement originating from *external* international sources—via private standards—also plays an important role in enforcing minimum wages. While there is a vast literature on private standards, international trade, minimum wage adjustments, and compliance, to the best of our knowledge, the intersection of all these together has not yet been studied and will be the focus of this paper.

[7] Bhorat et al. (2021) used the Labour Market Dynamics Study, which is based on the QLFS from StatsSA. As discussed above, the extent of minimum wage non-compliance may be overstated following the minimum wage increase in 2013 if the authors did not use the unimputed, raw earnings data which was made available to the research unit that conducted the research.

[8] Since the longitudinal tax data does not cover the period before and after the introduction of agricultural minimum wages in 2003, it is not clear whether the employment losses following the introduction of minimum wages were primarily driven by a decrease in the number of new entrants or by an increase in employment separations.

3 Background

3.1 Farmworkers' minimum wages and strikes

During the period of analysis (2010/11–2017/18), farmworkers' minimum wages and employment terms and conditions were set through Sectoral Determinations and reviewed every three years (see, for instance, Republic of South Africa 2013b). Farmworkers' legislated minimum wages would usually increase annually by the consumer price index plus 1 to 1.5 percentage points. However, on 1 March 2013, legislated minimum wages were increased by more than 50% following farmworker strikes (Republic of South Africa 2013). Small-scale strikes started in August 2012 in response to initial wage cuts on one farm in the Western Cape region (South African History Online 2019). The farmworker strikes were successful in reinstating the previous wage levels. This inspired farmworkers in the region to contend for even better wages and working conditions and widespread farmworker strikes broke out in October and November 2012 throughout the region. Despite attempts to negotiate at the farm level, no agreements were reached. On 15 November 2012 the Department of Labour announced that it would cancel the sectoral determination that was in force at that time and initiate a process to review minimum wages in the sector (Republic of South Africa 2012). On 5 February 2013 the new minimum wage was announced and increased from ZAR69 to ZAR105 a day, effective from 1 March 2013 (Republic of South Africa 2013).

While the new minimum wage only came into effect on 1 March 2013 (the start of the 2013/14 tax year), two factors signalled that the increase would be substantial and increase by more than the usual annual increases. Firstly, the Department of Labour announced its intention to cancel the current sectoral determination and started a minimum wage review on 15 November 2012. Secondly, the farmworkers demanded a daily wage of ZAR150 (more than double the minimum wage at the time). Farmers therefore likely anticipated a large increase in the legislated minimum wage.

We hypothesize that exporting farmers were more likely to anticipate the minimum wage hike for a few reasons. Section 2 showed that firms that export are subject to foreign stakeholder preferences and that this generally led to increases in CSR activities (Newman et al. 2018). Moreover, Darroch (2010), Du (2018), and Maertens and Swinnen (2009) indicate that private standards often go beyond the regulations of most countries and thus expect more from exporters than what the local authorities or markets expect of local producers. Moreover, Louw and Van Dyk (2024) indicate that international agricultural stakeholders constantly update their requirements with respect to ethical and social audits and monitor worker welfare to ensure that workers involved in agricultural exports are not exploited. Given these factors, it could be that exporters were more pressurized by international stakeholders to increase wages compared to farmers selling their produce in the local market—even before the new minimum wage was implemented—with an anchor point at the demanded daily wage of ZAR150. Farmers who export to markets where adherence to private standards are de facto obligatory—where compliance with minimum wage legislation is required—may have been the first to increase wages even before the minimum wage was officially raised. This may be of particular relevance to farmers who were due to undergo their annual audit to ensure the continuation of their GLOBALG.A.P. certification in the last quarter of the 2013 tax year—after the Department of Labour announced the review but before the announcement of the new minimum wage. This proposition is tested in Section 4.2.

3.2 Private standards within the agricultural sector

Private standards in the agricultural sector were established to ensure food security, especially within the context of globalization, information asymmetries between sellers and buyers, and increasing consumer preferences, inter alia (Henson 2007; Henson and Reardon 2005; Humphrey 2008; Humphrey and Schmitz 2000). Access to certain markets is conditional on being certified against a private standard (Maertens and Swinnen 2009). The most commonly requested private standard of exporters that want to export fresh fruit and vegetables to the EU is GLOBALG.A.P. (Hobbs 2003; Ministry of Foreign Affairs of the Netherlands 2014, 2024).[9] While some retailers in other regions may have also requested fresh fruit and vegetables exporters to have GLOBALG.A.P. certification during our period of analysis, it did not restrict market access as it did in the EU. For instance, many retailers in Africa require South African fresh fruit and vegetable exporters to be compliant with SAGAP (Grwambi 2024)—a South African certification body specializing in food safety and management systems.[10] Moreover, to date, fruit and vegetable exporters in South Africa can export to certain countries and regions (such as the United Arab Emirates and the Middle East) where no private standards certification is required (Louw and Van Dyk 2024). Given these contextual factors, we run our analysis for different export destinations and regions—the EU, Southern African Development Community (SADC), and regions outside of the EU and SADC.[11] While the United Kingdom (UK) was still part of the EU during the period of analysis, GLOBALG.A.P. did not necessarily guarantee market access to the UK. The Red Tractor Assurance programme is more widely used in the UK and, in addition, some of the largest retailers in the UK, such as Tesco and Marks and Spencer, have their own retail-level private standard (Henson and Humphrey 2010; Marks and Spencer n.d.; Red Tractor 2021; Tesco 2020). The requirements were not standardized for those exporting to the UK and were also not constant over time, which makes it challenging to assess whether our outcome variables were driven by the minimum wage hike or changing requirements of private standards. As such, our EU grouping excludes the UK but is included in the groupings to destinations other than the EU and SADC.

While the main focus of private standards during the period of analysis was on food safety, GLOBALG.A.P. required producers to comply with laws and regulations, including laws relating to workers' welfare.[12,13] To become certified with GLOBALG.A.P., producers thus need to adhere

---

[9] While some requirements of exporters of fresh fruit and vegetables products are legislated (such as maximum residue levels for pesticides in and on food products), some requirements—such as private standards certification—are not legislated. Retailers and importers request private standards and not governments. As such, finding (historic) data on which private standards were needed to export to a certain country or region is difficult. We thus rely on the one case where market access is restricted by GLOBALG.A.P., namely the EU (Ministry of Foreign Affairs of the Netherlands 2014, 2024).

[10] SAGAP requirements are not as strict as, for instance, GLOBALG.A.P. and do not have any requirements in terms of local labour compliance as with GLOBALG.A.P. SAGAP requirements are discussed below (SAGAP 2011).

[11] See Table A2 in the Appendix for a list of countries to which farmers in South Africa export fresh fruit and vegetables outside of the EU and SADC.

[12] GLOBALG.A.P. (previously called EUREPG.A.P.) sets out certain criteria and classifies each criterion either as a 'minor must' or 'major must'. Since (at least) 2007 a 'major must'requirement has been for producers to comply with national laws regarding workers'welfare. An excerpt from the compliance list (see EUREPGAP 2007) says: 'Documentation is available that demonstrates that a clearly identified, named member of management has the responsibility for ensuring compliance with existing, current and relevant national and local regulations and the implementation of the policy on workers'health safety and welfare.'This criterion remained in place until (at least) 2021 and thus covers our period of analysis (GLOBALG.A.P. 2021).

[13] The focus of private standards within the agricultural sector has expanded significantly since their inception. Initially, private standards within the agricultural sector focused primarily on food safety matters but is evolving consistently.

to local minimum wage legislation. If producer responses (trade diversion, wages, and employment) to the minimum wage hike differ by export destination it is highly probable that this is driven by the private standards certification that was required.

4 Data and methodology

4.1 Data and sample selection

We use two sources of administrative tax data from South Africa between 2010/11 and 2016/17.[14] The first source comes from employee income tax certificates (often referred to as IRP5/ IT3a certificates) and the second comes from exports data (National Treasury and UNU-WIDER 2023a, 2023b). The employee income tax certificates were described in detail in Piek et al. (2023). As in that paper, we restrict the sample to low-wage jobs.[15] To circumvent the possibility of workers 'earning themselves out of the sample', we restrict our sample to workers who earned below this threshold in all waves of the panel. As in Piek et al. (2023), we used the source code 3601—the source code mainly used for salary and wages—to define salary and wages. The wages and salaries reported under the 3601-source code made up, on average, 94% of the sample's total income earned. While the sample used by Piek et al. (2023) was restricted to the main job per individual, this paper's sample allows individuals to hold multiple jobs per year. The former required a rectangularized dataset to investigate worker entry and exit, but, since this chapter does not focus on worker flows, all jobs held by specific workers were included in the sample. The employee income tax certificates were then aggregated to the firm level to create a firm panel. The panel includes key variables such as firm anonymized unique identifiers, the number of jobs, average firm wages, the average proportion of the year that workers worked, and industry codes. This data source will be used to estimate the effects of a minimum wage hike on employment, wages, and the proportion of the year worked. The exports data includes a range of variables.[16] Key variables include anonymized unique firm identifiers, the destination country, the value of the exports, and Harmonised System 6 (HS6) codes. We created a firm-year panel that includes indicators of whether the firm exported to the EU, SADC, and destinations other than the EU and SADC. We also classify which region is the firm's' main export destination (defined either as exporting their highest monetary value to a destination or exporting the most shipments to the destination in a given year). The firm-level panel also includes the total value of exports, the proportion of fresh fruit and vegetables that made up the firm's export basket.[17] The exports data

Social and environmental audits have become increasingly important and it is likely that animal welfare matters will become increasing important going forward (Louw and van Dyk 2024).

[14] Although the data is available for more recent years, we end the analysis in the 2016/17 tax year. This is because the National Minimum Wage (NMW) Bill was published in the 2017/18 tax year, and we want to avoid any spillovers or anticipation effects ahead of the NMW.

[15] The same threshold was used as in Piek et al. (2023) but rebased to December 2021 values. The cut-off value for inclusion in the sample was ZAR6,515 per month (in real terms). Since employee income tax certificates are filed on an annual basis (and, as such, contain wages for the year), the reported number of periods worked in a tax year was used to create monthly earnings, as in Piek et al. (2023).

[16] The exports data is collected using the SAD500 and CD1 forms (see SARS (n.d a, n.d.b) to see what is contained on the forms). See Pieterse et al. (2018) for an overview of the exports data.

[17] The HS6 codes that were used to identify fresh fruit and vegetables were: 070110-070999, 080110-080610, 080711-081090 (see World Customs Organization n.d.). See Table A3 in the Appendix for the product descriptions.

was merged into the firm-level employment data and was used to identify exporting firms, identify farmers who export fruit and vegetables, and distinguish between different export destinations.

While farmers can use specialized exporting firms that handle logistical, marketing, and administrative aspects related to exporting their products on their behalf (Hanief 2018), our sample focuses only farmers who export without such an intermediary. Although the exports data records all exports—either on behalf of groups of farmers in the name of intermediaries or those who export without an intermediary—the data does not allow us to link products exported by intermediary exporting firms back to the individual farmers. This link is required for our estimation strategy. Our sample therefore includes a subset of farmers who produce for export markets. Farmers were able to exit our sample if they stopped exporting or switched to exporting through an intermediary. Farmers who export without the use of an intermediary are likely to be larger, on average, than farmers who export with the use of an intermediary. This is because all exporting documentation and requirements must be done by themselves, and this type of expertise is more likely to be found in larger farming operations (Hanief 2018). To restrict our sample to farmers who export without an intermediary, we restricted our sample to those who exported fresh fruit and vegetables using the HS6 codes in the exports data and had an industry code (*mainincomesourcecode*) in the employee income tax certificate data that falls within the agricultural, forestry, and fishing sector. Moreover, we focus on farmers who primarily export fresh fruit and vegetables—where these products made up over 90% of the farms' export revenue—as these products are among the most affected by private standards (Garcia Martinez and Poole 2004; Unnevehr 2000; World Trade Organization 2009).[18]

As mentioned in the introduction, while we have the number of South African-based fresh fruit and vegetables farmers who are certified by GLOBALG.A.P. (see Table A1 in the Appendix), we cannot merge this information with the tax data as the tax data is de-identified. We therefore rely on export destinations where private standards fully restrict market access—the EU—to estimate the effect of private standards on trade outcomes, employment, wages, and proportion of the year worked.

Lastly, to control for climate shocks, we merge in annual provincial rainfall from the South African Weather Service (Mkhwanazi 2019).

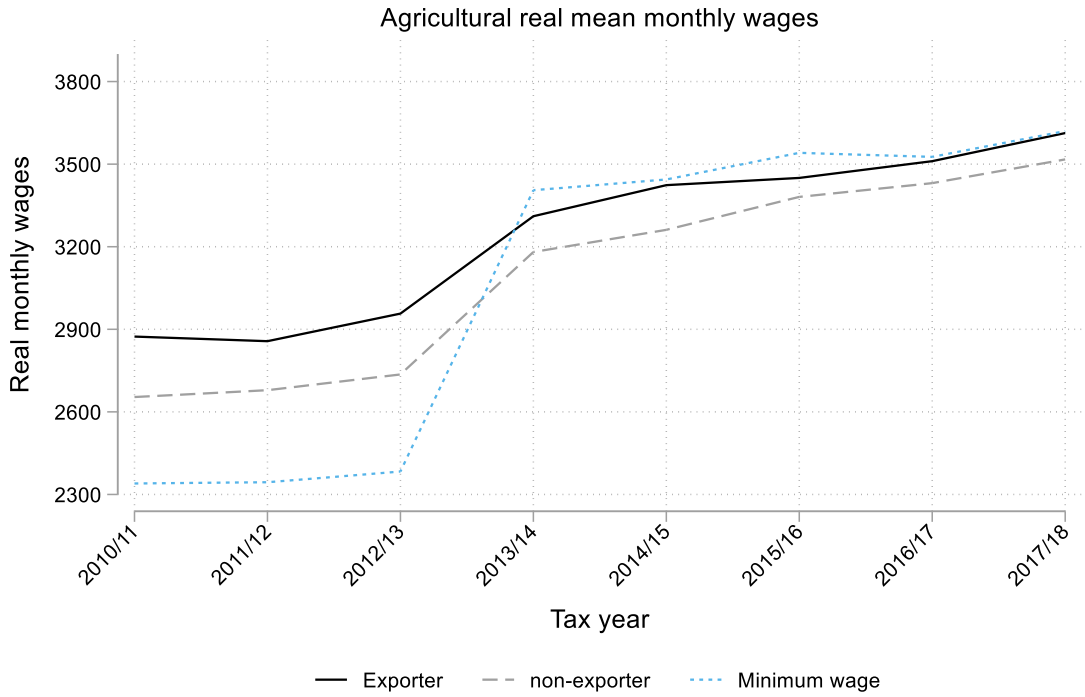
4.2 Methodology

Following Piek et al. (2023), Bossler and Gerner (2020), and Harasztosi and Lindner (2019), the effects of the minimum wage hike are estimated by comparing the changes in outcome variables—export stance and destination, employment growth, wages, and the proportion of the year worked—between firms with a high proportion of workers affected by the minimum wage increase and firms with a lower proportion of affected workers. An 'affected' worker is defined as one who was paid below the new minimum wage threshold before its implementation. In this paper we calculate the fraction of affected workers as the proportion of workers in the 2011/12 tax year that earned below the minimum wage that was implemented at the beginning of the 2013/14 tax year. We choose this period to construct our treatment variable because exporters were more likely to increase wages in anticipation of the minimum wage increase due to international stakeholder preferences, as outlined in Section 4.2. Figure 1 plots average agricultural real monthly wages over time by export status. Average wages already increased in the 2012/13 tax year and—as argued

[18] To put this into context, Table A1 in the Appendix shows the number of producers in South Africa that are certified by GLOBALG.A.P. by product type. Essentially, all certified producers are certified for fruit and vegetables.

earlier—exporters responded to potential wage increases before they were announced.[19] Using the 2012/13 tax year to calculate the fraction of workers affected would therefore underestimate treatment and overstate estimates. The 2011/12 tax year is thus used as our base year in our models.

Figure 1: Average agricultural real monthly wages by export status and the minimum wage



Note: the sample is restricted to low-income individuals, defined as individuals who, throughout the period of analysis, consistently earned less than ZAR6,515 per month in real terms. December 2021 is used as the base period to convert values into real terms.

Source: own calculations using Version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER 2023a, 2023b).

The nature of our four outcome variables is different and, as such, we use different models to estimate the effects of the minimum wage hike on the various outcome variables. Table 1 summarizes which models were used for the different outcome variables and whether offsets or lagged dependent variables were included in the regressions or not. Firm-level employment is a count variable. We therefore estimate this specification using negative binomial regressions that account for the discrete nature of the dependent variable as discussed by Piek et al. (2023). We also utilize count models for the wage regressions, where the coefficients can be interpreted as semi-elasticities, similar to semi-log linear models. Mullahy and Norton (2023) argue that count models are preferable to semi-log ordinary least squares (OLS) models because they naturally account for zeros in the estimation process. In contrast semi-log OLS regressions typically exclude these zero values unless alternative transformations are applied. Although researchers often add a

[19] Figure 1 is based on the employee income tax certificate data which only includes annual wages, not monthly wages. Monthly wages were constructed by us and was described in greater detail in Piek et al. (2023). Given that the main farmworker strikes, and minimum wage review announcement occurred in the last third of the tax year, the increase in average wages in the last third of the tax year was likely more than what is reflected in the increase in the annual average wage. We unfortunately cannot show and test that and need to rely on the annual figures. While the average wage increase in 2012/13 among exporters and non-exporters was statistically significant, the increase among exporters was larger (ZAR100 compared to ZAR58).

small constant to zero values before taking the logarithm, this method can produce results that are sensitive to the arbitrary choice of the constant (Bellemare and Wichman 2020; Mullahy and Norton 2023). Count models avoid the need for such arbitrary transformations and are therefore used for the employment and wage regressions in this study. The export stance regressions were run using logit models, whereas the fraction of year worked specifications were run using a group logit.

Table 1: Models used for the various outcome variables

Outcome variable	Model	Offset	Lagged dependent variable	Equation used
Export stance and destination	Logit	No	Yes	2
Employment (growth)	Negative binomial	Lagged employment	No	3
Wages	Negative binomial	Proportion of year worked	No	4
Proportion of year worked	Group logit*	No	No	2

Note: *a group logit was used by transforming the proportion of year worked variable as follows: log(proportion of year worked /(1- proportion of year worked)) and running a linear model on this transformed variable.

Source: authors' own summary.

Equation (1) shows the general difference-in-difference specification that we use for the export stance and proportion of year worked regressions and is equivalent to equation (2). The employment and wage regressions include an offset and are shown in equations (3) and (4). The use of an exposure variable in equations (3) and (4) was explained in by Piek et al. (2023). In short, in our models of employment, where we use lagged employment as the exposure variable, we essentially model year-to-year employment growth. In the wage regressions we use the average proportion of the year worked as the offset variable to account for differences in seasonal and full-time work that contribute differently to annual earnings.

$$y_{it} = e^{(x_{it}\beta + u_{it})} = exp(\alpha + \omega_t year_t + \theta FA_i + \delta_t year_t \times FA_i + \gamma' w_{it} + u_{it}) \quad (1)$$

$$log(y_{it}) = x_{it}\beta + u_{it} = \alpha + \omega_t year_t + \theta FA_i + \delta_t year_t \times FA_i + \gamma' w_{it} + u_{it} \quad (2)$$

$$log(y_{it}) = x_{it}\beta + u_{it} = \alpha + \omega_t year_t + \theta FA_i + \delta_t year_t \times FA_i + \gamma' w_{it} + log(\mathrm{e}_{it-1}) + u_{it} \quad (3)$$

$$log(y_{it}) = x_{it}\beta + u_{it} = \alpha + \omega_t year_t + \theta FA_i + \delta_t year_t \times FA_i + \gamma' w_{it} + log(\mathrm{e}_{it}) + u_{it} \quad (4)$$

where y_{it} is the outcome variable (export stance, employment growth, wages, and proportion of the year worked) for firm *i* in period *t*, and $year_t$ a set of time fixed effects. The 2011/12 tax year is used as the base year. FA is the firm-level *fraction affected* variable, which measures the proportion of workers in 2011/12 in firm *i* who earned less than the new minimum wage that was implemented in 2013/14. The *fraction affected* variable is constant within a firm over time. w_{it} is a vector of control variables and includes annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the average age of workers.

As in Piek et al. (2023), coefficients on the difference-in-difference terms, δ_t, measure percentage changes in the outcome variables for fully affected firms (in which all workers were initially paid

below the new minimum wage) relative to completely unaffected firms (in which all workers were already paid above the new legislated minimum wage before its implementation).

A separate difference-in-differences term is estimated for each tax year, enabling us to monitor the effects over time. When feasible we also estimate the difference-in-differences terms for years preceding the policy's implementation. If the estimates for the pre-policy period are insignificant, it supports the common trends assumption, which is crucial for the validity of the difference-in-differences approach. In the regressions, where we incorporate a lagged offset or control for a lagged variable, we lack a pre-period, making it impossible to assess whether the common trends assumption holds. Although employee income tax data is available for earlier years, the data shows instability over time and is unreliable before the 2010/11 tax year (see **Error! Reference source not found.** in the Appendix).

We run the regressions separately on sub-samples of nine export destinations—the EU, SADC, destinations other than the EU and SADC. Within these categories we further differentiate whether they represent farms' main export destination or not. The main destination is defined in two ways: firstly, whether a farm exports its highest export value to a certain destination and, secondly, whether a farm exports most frequently to a certain destination. We hypothesize that, if exporting farmers' responses to the minimum wage hike differ by export destination, it is driven by the private standards that were required by importers in those destinations. As discussed in Section 3.2, we excluded the UK from the EU sample but ran the analysis separately for the UK and present the econometric results in the Appendix. By comparing the results for farmers that do not export to the EU and SADC to those that export to the UK, one will be able to tell what extent of the results for the former grouping is driven by private standards required in the UK.

We clustered the standard errors at the firm level. Besides the unweighted estimates, we also present results weighted by firm size, which we define as the number of jobs before the policy was implemented, in the Appendix. The unweighted results do not account for firm size, whereas the weighted ones recognize that larger firms have a more significant influence on aggregate outcome variables in the broader economy. By comparing these two sets of results, we can gain insight into how firm size affects the observed changes. However, because the sample is limited to mainly *large* exporting firms (as discussed in Section 5), the weighted regressions are not necessarily fit for purpose and yield large coefficients and wide confidence intervals. Therefore, we interpret these findings cautiously.

Similarly to Piek et al. (2023), this analysis includes only firms that had at least one agricultural employee in the base year. Our sample excludes farms that began operating after 2011/12. However, firms that shut down after the base year are included in the analysis until they cease operations. Therefore, our results are limited to understanding the impacts of the policy on pre-existing farms, but only up until the point they close down.

4.3 Limitations

While the data includes the number of reporting periods that workers were employed for, it does not contain information on the number of hours worked. Given the minimum wage compliance angle of this paper, it is worthwhile to provide more details on this matter. The monthly minimum wage corresponds to the assumption of a 45-hour week, and according to the Post-Apartheid Labour Market Series (PALMS), the average number of hours worked by farm workers is between 43 and 46 hours per week during our period of analysis (Kerr et al. 2019). Moreover, approximately two-thirds of farmworkers worked between 40 and 50 hours per week. The 10^{th} percentile for hours worked is at 40 hours a week and the top 25% of farm workers worked more than 50 hours a week. For roughly two-thirds of our sample, our treatment variable will thus most likely correctly

pick up the treated versus the untreated. For the 10% of farm workers that worked less than 40 hours a week, we are likely to overstate treatment and understate their contribution to our estimates, while, for the top 25%, we will likely understate treatment and overstate their contribution to our estimates.

Moreover, if hours changed as a result of the minimum wage hike, the effects we estimate on monthly wages could be misleading because they could be driven either by a change in wages or hours worked. While descriptive statistics on the number of hours worked do not indicate a change in hours worked after the minimum wage hike, this observation needs to be tested econometrically. However, the current evidence is not reliable because of other data limitations.[20] Specific to this paper, we also do not know how hours worked are distributed across the different export destinations and can thus not identify why monthly wage levels differ by export destination (shown in Section 5). This could be driven by differences in the wage rate or hours worked, and future work will need to investigate this in more detail.

Moreover, the sectoral determination that regulated agricultural minimum wages during the period of analysis allowed employers to deduct up to 20% of the workers' wages for food and accommodation (Republic of South Africa 2006). While there are source codes under which such deductions could be reported (for instance source 3801: general fringe benefits), only 5% of farms in our sample used this source code. It appears that farmers do not report these deductions on the employee income tax certificates in a consistent manner and that the wage levels reported may reflect wages after 20% has been deducted. If this is the case, then our treatment variable would be overstated and our estimates underestimated.

5 Descriptive statistics

This section shows descriptive statistics for the sample used in this paper—farmers in South Africa for whom at least 90% of their export revenues are derived from fresh fruit and vegetables and who export without the use of an intermediary. This sample represents more than 70% of fresh fruit and vegetable exports from farmers who export independently of an intermediary from South Africa.

Table 2 shows the number of farms that export to various regions. Since the number of farms is relatively low, we cannot be certain of the external validity of our results. However, they represented between 15% and 31% of all fresh fruit and vegetable exports from South Africa (see Table A5 in the Appendix) and issued, on average, between 224 and 843 income tax certificates per year, which represent the number of jobs (see Table 3 for the total number of jobs by export destination).

[20] In the South African literature three methods have been used to assess the impact on hours worked (Van der Zee 2017). One method includes comparing changes in hours worked among farm workers to those of a control group. Another method includes identifying treatment intensity using the wage gap approach at a district council level. A third approach relies on individual-level variation in pre-treatment wages to measure treatment intensity. Van der Zee (2017) acknowledges that the method that relies on identifying a suitable control group is sub-optimal as the agricultural sector faces unique shocks that are likely not experienced in other sectors and their preferred method was the wage gap method. However, the wage gap treatment variable used by Van der Zee (2017) and the individual-level variation in pre-treatment wages used by Bassier and Ranchhod (2024) both rely on imputed QLFS wage data that has shortcomings (Kerr 2024; Kerr and Wittenberg 2021). Until unimputed, raw data from StatsSA is used in the analysis, or better imputed wage data is released, we cannot properly assess the impact on hours worked.

Table 2: Number of firms that export by destination region

	Number of farms that export:								
	to EU	highest amount to EU	most frequently to EU	to SADC	highest amount to SADC	most frequently to SADC	not to EU and SADC	highest amount not to EU and SADC	most frequently not to EU and SADC
2010/11	60	38	38	40	19	23	18	38	34
2011/12	58	36	38	37	20	23	13	38	33
2012/13	59	39	33	43	21	21	16	39	45
2013/14	58	37	42	39	22	24	16	39	32
2014/15	57	36	36	38	19	21	15	41	39
2015/16	68	44	40	38	18	19	13	38	41
2016/17	75	46	46	24	<10	<10	13	44	45

Note: the EU group excludes the UK, as discussed in Section 3.2. The sample includes farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and export without the use of an intermediary. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER 2023a, 2023b).

Table 3: Number of jobs within farms that export by region

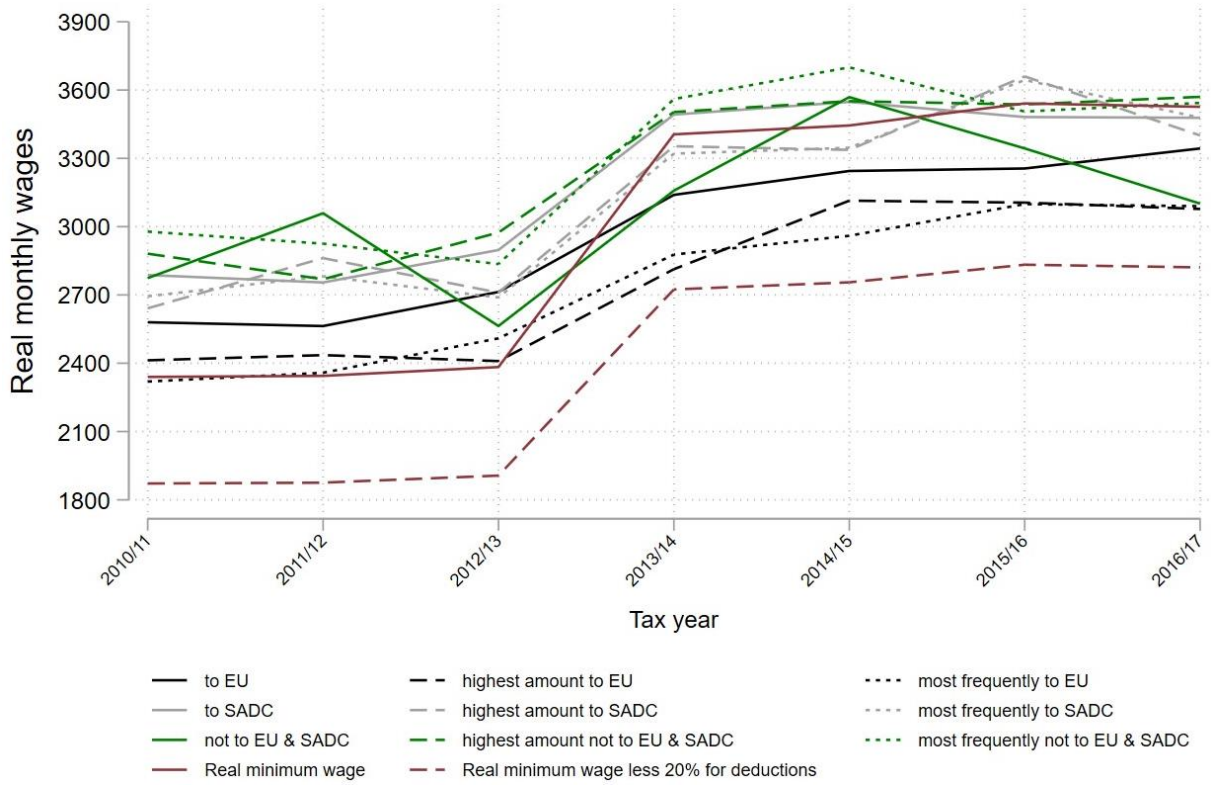
	Number of jobs within farms that export:								
	to EU	highest amount to EU	most frequently to EU	to SADC	highest amount to SADC	most frequently to SADC	not to EU and SADC	highest amount not to EU and SADC	most frequently not to EU and SADC
2010/11	32,068	23,492	18,212	16,627	5,998	7,853	9,446	16,503	19,928
2011/12	31,452	19,694	21,999	24,861	16,865	17,976	3,629	16,674	13,258
2012/13	28,606	19,068	18,189	26,624	14,536	14,837	8,733	18,957	19,535
2013/14	28,824	18,415	21,302	14,155	5,111	5,847	7,039	17,980	14,357
2014/15	34,811	23,460	25,662	25,297	11,980	12,513	5,186	18,326	15,591
2015/16	42,857	24,844	29,127	18,369	4,988	4,249	5,614	23,133	19,589
2016/17	44,167	28,281	29,826	12,973	3,301	2,974	6,308	23,104	21,886

Note: the EU group excludes the UK as discussed in Section 3.2. The sample includes farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and export without the use of an intermediary. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER 2023a, 2023b).

Figure 2 plots the monthly real wages by export region for our sample relative to the real minimum wage and the real minimum wage less 20% to allow for food and accommodation deductions as per the sectoral determination described in Section 4.3. The data limitations described in Section 4.3 regarding hours worked and the tax data not fully capturing the deductions for accommodation and food need to be taken into account when analysing the wage trends.

Figure 2: Monthly real agricultural wages by export region



Note: the EU group excludes the UK as discussed in Section 3.2. The sample includes farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising of at least 90% of their export revenue) and export without the use of an intermediary. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR 6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER 2023a, 2023b).

Before the minimum wage was raised, average monthly wages were for the most part above the legislated minimum wage. From the year before the minimum wage was raised, average wages increased, but at different speeds by export destination. Despite the large increase in the minimum wage, average farmworker wages increased to the minimum wage, and in some cases above it. Surprisingly, average wages on farms that exported to the EU (excluding the UK as discussed in Section 3.2) were lowest, despite the focus on labour law compliance within the GLOBALG.A.P. certification process. Average wages are highest amongst farms that export to destinations other than the EU and SADC. Figure A1 in the Appendix plots the average wages for farmers who export to destinations other than the EU and SADC (which includes the UK, see **Error! Reference source not found.** in the Appendix) and separately for the UK. See **Error! Reference source not found.** in the Appendix for descriptive statistics for farmers who export to the UK.[21] The wages paid by exporters to the UK are higher than those that export to destinations other than the EU and SADC, suggesting that the higher wages on farms that export to the UK may be driving the average for this group.

[21] The number of farms that export to the UK (see **Error! Reference source not found.** in the Appendix) is higher than those reported among farms that export to destinations other than the EU and SADC (see Table 2) and is driven by the fact that some of the farmers that export to the UK also export to the EU or SADC and would thus be excluded from the grouping 'to destinations other than the EU and SADC'.

Given that the average wages on farms that export to the EU are the lowest among all of the export destinations and the big focus on minimum wage compliance via GLOBALG.A.P., it is likely that we are overstating treatment intensity, and our results will be understated for this group. The level differences between the export destinations could be driven by differences in hours worked or differences in the extent to which food and accommodation were supplied to their farm workers, as discussed in the limitations section. Future work will need to investigate the differences observed across export destinations. Average wages for the EU export destinations were above 80% of the real minimum wage across time—implying that there was minimum wage compliance, on average, if farmers were making use of sectoral determination provision for accommodation and food deductions and workers were not working more than 45 hours a week.

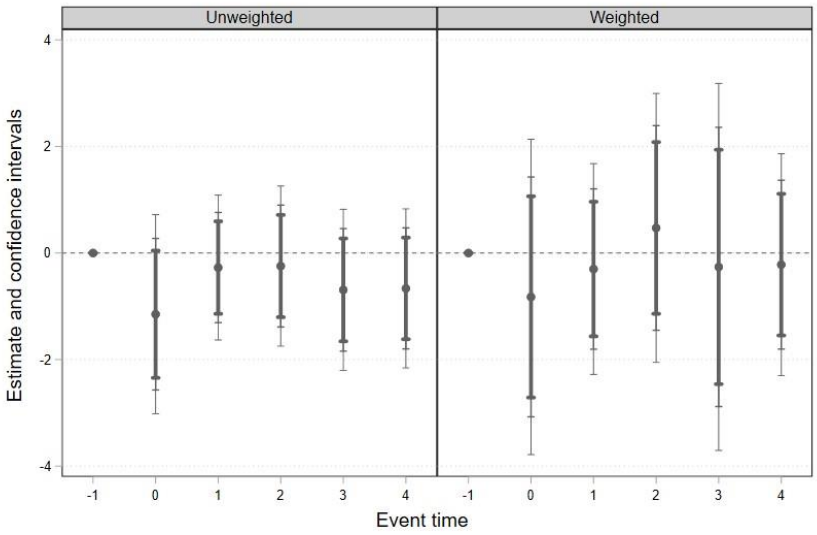
6 Econometric results

6.1 Minimum wage impact export stance and export destinations

Figure 3 plots the difference-in-difference coefficients from Equation (2) and the corresponding 90%, 95%, and 99% confidence intervals. The left panel shows the unweighted results, and the right panel shows the weighted results. The results indicate that the minimum wage hike did not affect the odds of exporting among all farmers. Figure 4 analyses whether the minimum wage hike led to trade diversion among the sample of farmers who primarily export fresh fruit and vegetables. The dependent variables in the successive columns are binary variables to indicate whether a farm i) exports to a specific region, ii) exports their highest export amount to a specific region, and iii) exports most frequently to a specific region. The rows indicate different regions: the top is for the EU, the middle is for SADC, and the bottom row is restricted to export destinations other than the EU and SADC. The top left panel shows that there was a decrease in the odds that fresh fruit and vegetables farmers export to the EU for two years. If the fraction of affected workers were to increase from 0% to 100%, the odds of exporting to the EU would decrease by a factor of between 3.2 and 5.3. With average fraction affected at 0.72, effects for the mean firm peak at 3.76 in 2013/14. However, not all farmers who export to the EU changed their export destination. Farmers whose main export destination is the EU, defined either by exporting the highest amount (in monetary terms) to the EU or by exporting most frequently to the EU, did not change their export behaviour as seen in the middle and right panels of the first row. This suggests that 'marginal' exporters to the EU—those who export to the EU but do not consider it their main destination—adjusted their export strategy in response to higher minimum wages. But exporters who dominantly traded with the EU continued to do so.

There was an increase in the odds of exporting to SADC among two groups: farmers who do not have SADC as their main trading partner and those who exported their maximum amount to SADC. The increased odds of exporting the maximum amount to SADC were statistically significant and substantial, between 3.2 and 8.5, for the first three periods, for farms where the fraction affected increases from 0 to 100%. There was also an increase in the odds of exporting to areas outside the EU and SADC. By the end of the analysis period, trade diversion stopped. 'Marginal' exporters to the EU initially diverted trade as a temporary strategy to assess how they could cope with the higher minimum wage or to become compliant with the new regulations and re-establish their GlobalGAP certification. While the unweighted results are our preferred results, we report and discuss the weighted results in the Appendix.

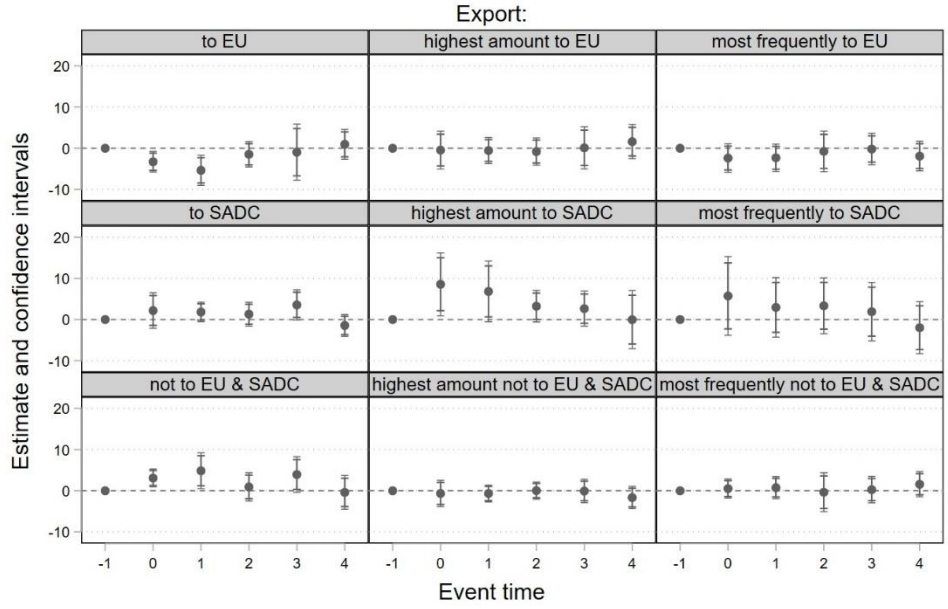
Figure 3: Minimum wage effect on the odds of farmers exporting



Note: the figure plots the difference-in-difference coefficients, δ_t, from Equation (2) using a logit regression. The full regression results are shown in Table A7 in the Appendix. The 90%, 95%, and 99% confidence intervals were plotted. The dependent variable is a binary variable to indicate whether a farm exports or not. Event time *t* = -1 indicates the base year, 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the average workers' age. Standard errors were clustered at the firm level. The sample consists of crop and fruit farmers who existed in 2011/12, irrespective of their export status. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER 2023a, 2023b).

Figure 4: Minimum wage effect on farmers' export destinations that predominantly export fruit and vegetables



Note: the figure plots the difference-in-difference coefficients (δ_t) from Equation (2) using a logit regression. The full regression results are shown in **Error! Reference source not found.** in the Appendix. The results are not weighted—see Figure A3 in the Appendix for the weighted results. The 90% and 95% confidence intervals were plotted. The dependent variables in the successive columns are binary variables to indicate whether a farm i) exports to a specific region, ii) exports its highest export amount to a specific region, and iii) exports most frequently to a specific region. The EU group excludes the UK as discussed in Section 3.2. Event time *t* = -1 indicates the base year, 2011/12. Controls include annual provincial rainfall and pre-policy values of the average

proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER 2023a, 2023b).

As explained in Section 3.2, the UK was excluded from the EU grouping but was included in the regressions for farmers that exported outside of the EU and SADC. Separate regressions for exporters to the UK were also run and are shown in Table A16–A19 in the Appendix. Table A16 shows that the minimum wage hike did not lead to trade diversion to or away from the UK. The only instance was in 2015/16 among large farms that increased their odds of exporting most frequently to the UK following the minimum wage hike.

Next, we assess how the minimum wage hike impacted employment growth rates, wages, and the fraction of the year worked by export destination—which proxies the extent of adherence to private standards that were required.

6.2 Minimum wage impact on employment growth, monthly wages, and fraction of year worked—by export destination

We find a decrease in employment growth on farms that traded mainly with the EU (see the top middle and top right panels of Figure 5). If the fraction of affected workers were to increase from 0% to 100%, employment growth rates would decrease by between 76% and 104% for farmers who export their maximum amount to the EU and by between 84% and 88% for farmers who export most frequently to the EU. With average fraction affected at 0.75 and 0.79 for the two groups, respectively, effects for the mean firm range between 57% and 78% and 66% and 69%. Farms that mainly trade with the EU made the largest wage adjustments (see the top middle and top right panels of Figure 6)—the effects for the average firm where the EU is the main export destination ranged between 76% and 111% compared to 30% to 47% when the EU was not the main export destination. This is in line with our expectation as the EU requires GLOBALG.A.P. certification that requires compliance with labour, and by implication, minimum wage laws.

Therefore, farmers that mainly traded with the EU did not divert trade away from the EU (as seen in Figure 4) and raised wages more aggressively than other farmers who exported less to the EU. These farmers complied with the private standards but did so at the expense of slower employment growth rates in 2013/14 and 2014/15 to cope with the higher minimum wage. However, from 2015/16, employment growth rates returned to pre-policy levels.

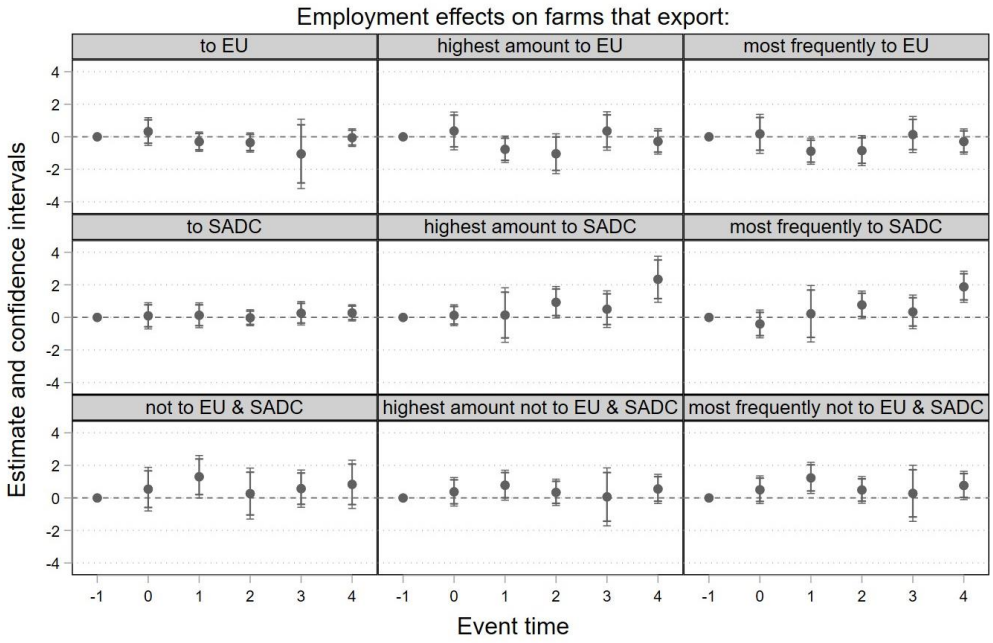
Farmers who export some of their produce to the EU but mainly export to other destinations (see the top left panel in Figure 5) responded differently to the minimum wage hike. Amongst this group, we find that wage increases were less than for farms whose main trading partner was the EU. Given their other options in international markets, these farmers did not depend solely on their EU certification and could therefore respond differently to the minimum wage hike. For this group of farmers employment effects were not statistically significant (see the top left panel in Figure 5) and there was trade diversion away from the EU (see Figure 4), where private standards were not as stringent.

Comparing the results between farmers who export primarily to the EU to those whose main export destination is outside of the EU, we find that farmers who export to the EU thus seem to have faced a trade-off in the short run in response to the minimum wage increase: either they had

to divert trade to another region or continue exporting to the EU but increase wages at the expense of slower employment growth.

In Figure 4 we observed an increase in farmers' odds of exporting their maximum amount to SADC and in Figure 5 we observe that the employment growth rate increased among farmers who trade primarily with SADC. Wages also increased on these farms in some years (2013/14, 2014/15, and 2016/17). Employment growth appears to follow the shift in trade patterns.

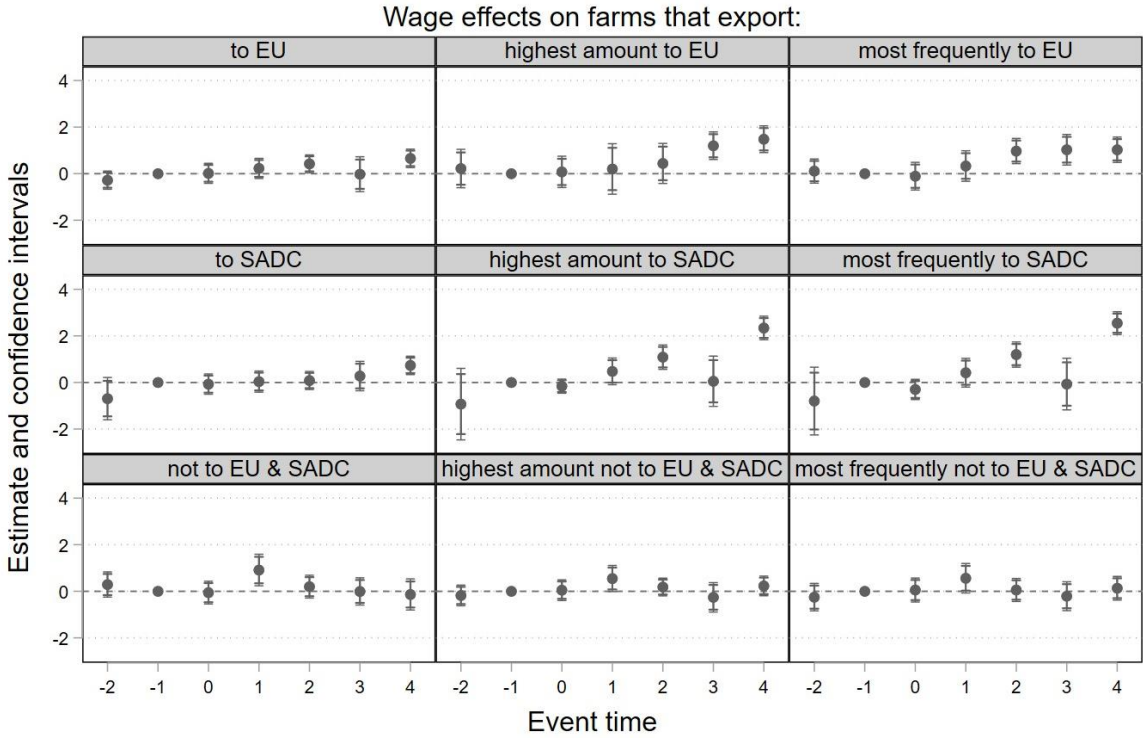
Figure 5: Minimum wage effect on employment growth among farmers who predominantly export fruit and vegetables



Note: the figure plots the difference-in-difference coefficients (δ_t) from Equation (3) using a negative binomial regression. Results are not weighted. The full regression results are shown in Table A10 in the Appendix. See Figure A4 in the Appendix for the weighted results. The 90% and 95% confidence intervals were plotted. The dependent variable in the successive columns is the number of jobs in farms that i) export to a specific region, ii) export their highest export amount to a specific region, and iii) export most frequently to a specific region. The EU group excludes the UK, as discussed in Section 3.2. The exposure variable is the firm size in the prior year. Event time *t* = -1 indicates the base year, 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER 2023a, 2023b).

Figure 6: Minimum wage effect on real monthly wages within farms that predominantly export fruit and vegetables



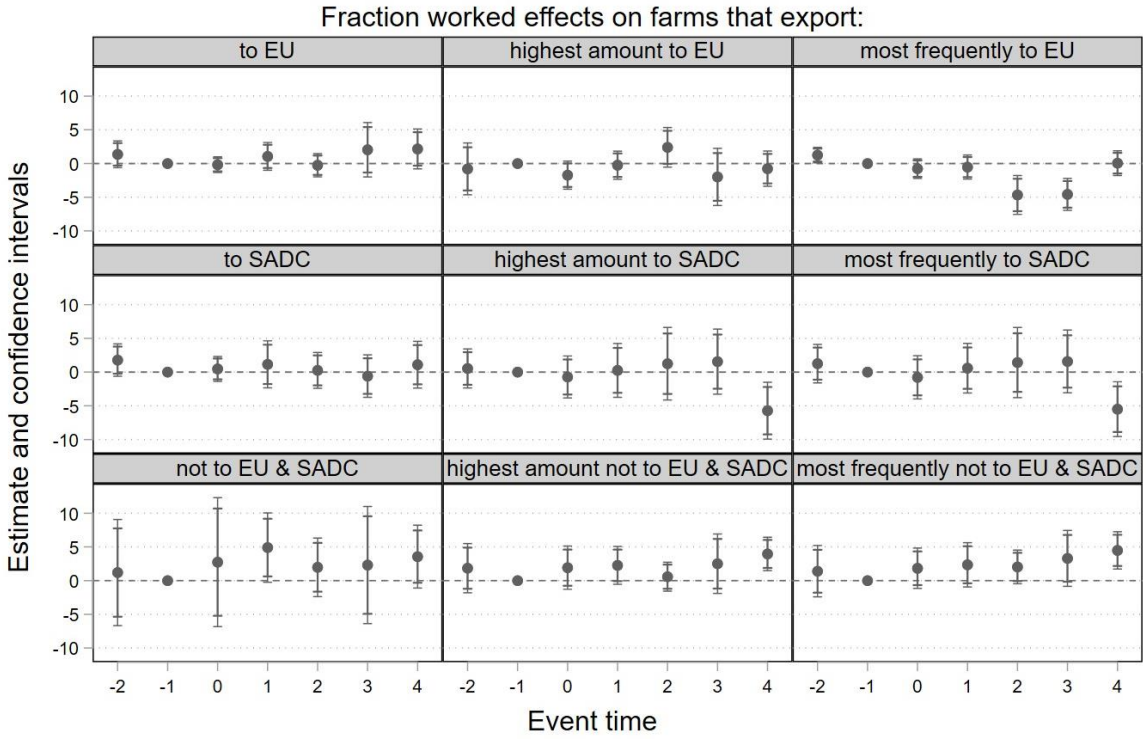
Note: the figure plots the difference-in-difference coefficients (δ_t) from Equation (3) using a negative binomial regression. Results are not weighted. The full regression results are shown in Table A12 in the Appendix. See Figure A5 in the Appendix for the weighted results. The 90% and 95% confidence intervals were plotted. The dependent variable in the successive columns is real monthly wages in farms that i) export to a specific region, ii) export their highest export amount to a specific region, and iii) export most frequently to a specific region. The EU group excludes the UK, as discussed in Section 3.2. The exposure variable is the proportion of the year that workers worked. Event time *t* = -1 indicates the base year, 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER 2023a, 2023b).

Firms, especially within the agricultural sector, can also adjust the seasonal and non-seasonal composition of their workforce in response to minimum wage shocks. We therefore also investigate the impact of the minimum wage on the fraction of the year workers worked. Figure 7 shows that, for most of the time, farmers did not adjust the fraction of the year worked in response to the minimum wage hike. The only instance where common trends hold, and a statistically significant effect is visible, is for the group of farmers who trade predominantly with SADC and whose main trading partner is not within the EU or SADC. While the former decreased the fraction of year worked, the latter increased the fraction of the year worked. The effects are furthermore limited to the final year of the analysis period. Figure A1 in the Appendix shows the weighted results and discusses the differences between the unweighted and weighted results.

Tables A16-19 in the Appendix show the results for farmers who export to the UK. Table A17 shows that the employment growth rate for farmers who primarily export to the UK increased after the minimum wage hike but that, where common trends hold, wage changes were not statistically significant.

Figure 7: Minimum wage effect on fraction of year worked within farms that predominantly export fruit and vegetables



Note: the figure plots the difference-in-difference coefficients, (δ_t), from Equation (2) using a group logit regression. Results are not weighted. The full regression results are shown in Table A14 in the Appendix. See Figure A6 in the Appendix for the weighted results. The 90% and 95% confidence intervals were plotted. The dependent variable in the successive columns is the transformed fraction of year worked (log(mean_fraction_worked/(1- mean_fraction_worked))) in farms that i) export to a specific region, ii) export their highest export amount to a specific region, and iii) export most frequently to a specific region. The EU group excludes the UK, as discussed in Section 3.2. Event time *t* = -1 indicates the base year, 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER 2023a, 2023b).

7 Discussion and conclusion

This paper investigated how private standards influence the responses of exporting farmers to a large minimum wage hike. While we used rich administrative data that is based on export records and employee income tax certificates, we were not able to directly identify farmers that are certified by private standards. We therefore relied on export destinations where private standards fully restrict market access—such as the EU—as a proxy for private standards, and used these classifications to estimate the effect of private standards on trade outcomes, employment, wages, and proportion of the year worked in response to the 2013 minimum wage shock. We hypothesize that if exporting farmers' responses to the minimum wage hike differ by export destination, it is probable that private standards explain the effect.

While the minimum wage hike did not change the odds of farmers exporting, we find that it resulted in some trade diversion primarily among dominant exporting fresh fruit and vegetables farmers. Specifically, farmers who export to the EU but for whom the EU is not their main trading partner diverted their trade away from the EU for two years. In contrast farmers whose main export destination is the EU did not divert trade elsewhere. Farmers who diverted trade away from the EU raised wages to a lesser extent—likely at the possibility of losing their certification—but were able to keep employment growth unchanged. Conversely, those primarily exporting to the EU increased wages more but experienced a temporary decline in employment growth in response to the minimum wage hike. By the end of the analysis period, no trade diversion and no downward employment growth persisted. Trade diversion and employment were thus only used as a temporary adjustment mechanism until farmers could adjust to the new legislated minimum wage and could become compliant with private standards. The farmers who export to the EU—where GLOBALG.A.P. plays an important role in market access—seem to have faced a trade-off in the short run when faced with the minimum wage increase: either divert trade to another region or increase wages but at the expense of slower employment growth. While there is a vast literature on the effects of private standards on firm behaviour, worker welfare, and international trade, our results are the first, to the best of our knowledge, to show that private standards requiring labour law compliance influence export destinations, minimum wage compliance, and employment effects in response to minimum wage shocks. This new finding has implications for farmers, private standards organizations, and policy makers in developing countries, which we discuss below.

When deciding where to export, and by implication whether to be certified against a certain private standard, farmers should factor in the potential impact of future shocks related to any of the standard's requirements, such as minimum wage increases. To ensure compliance with these standards even in the face of unexpected labour law changes, farmers need to evaluate their ability to meet these requirements. Becoming certified by a private standard is costly (Darroch 2010; GLOBALG.A.P. 2024; Thorstensen et al. 2015). Farmers who struggle to cover certification costs—including annual audits, infrastructure upgrades, and training—should ensure that they can cope with possible future shocks such as minimum wage hikes. If they have limited financial margin to absorb such shocks, they might need to reconsider their choice of export destinations. On the other hand, firms with an established footprint in EU export markets did not divert trade, suggesting that they had considerable financial margins that could have *resulted* from adhering to private standards, and that this in turn allows them to continue operating in these markets.

The development of private standards has been criticized for lacking participation and transparency. Stakeholders, often from developing countries and often directly affected by the private standards, are frequently not consulted (Fuchs et al. 2011). This paper demonstrates that private standards interact with minimum wage shocks in the exporting country. Private standard organizations should consider how their requirements impact farmers and their workforce in developing countries. For instance, this paper showed that farmers who primarily exported to the EU did so at the expense of slower employment growth, even if temporarily, which carries economic costs in high-unemployment contexts like South Africa. Another consideration is the potential supply shocks in the importing country if trade is diverted to other countries where private standards are not required. These supply shocks could affect prices and competition in the importing countries and should be taken into account in future discussions.

Research has shown that the relationship between minimum wages and employment depends on the extent to which minimum wages are enforced (Munguía Corella 2020), with employment losses being less pronounced in developing countries due to non-compliance (Bhorat et al. 2017). However, enforcement discussions within the labour law compliance literature typically focus on home government efforts. Recent studies, however, indicate that private standards also play a

significant role in enforcing national and international laws (Trifković 2017). Policy makers in developing countries should consider potential employment adjustments in response to minimum wage increases in environments with high enforcement, such as through private standards for farmers exporting to the EU.

References

Adolph, C., V. Quince, and A. Prakash (2017). 'The Shanghai Effect: Do Exports to China Affect Labor Practices in Africa'. *World Development*, 89: 1–18. https://doi.org/10.1016/j.worlddev.2016.05.009

Bassier, I., and V. Ranchhod (2024). 'Can Minimum Wages Effectively Reduce Poverty Under Low Compliance? a Case Study from the Agricultural Sector in South Africa'. *Review of Political Economy,* 36(2): 398–419. https://doi.org/10.1080/09538259.2024.2318957

Bellemare, M.F., and C.J. Wichman (2020). 'Elasticities and the Inverse Hyperbolic Sine Transformation'. *Oxford Bulletin of Economics and Statistics*, 82(1): 50–61. https://doi.org/10.1111/obes.12325

Berning, A. (2014). 'Sustainable Supply Chain Engagement in a Retail Environment: the Case of Woolworths' Food Suppliers'. Unpublished Master's thesis. Stellenbosch: Stellenbosch University. Available at: https://scholar.sun.ac.za/items/98c5eeff-6acb-4937-bf9b-f06712edf0ab (accessed 1 August 2024).

Bhorat, H., R. Kanbur, and N. Mayet (2012). 'Minimum Wage Violation in South Africa'. *International Labour Review*, 151(3) :1–46. https://doi.org/10.1111/j.1564-913X.2012.00149.x

Bhorat, H., R. Kanbur, and N. Mayet (2013). 'The Impact of Sectoral Minimum Wage Laws on Employment, Wages, and Hours of Work in South Africa'. *IZA Journal of Labor and Development*, 2(1): 1–27. https://doi.org/10.1186/2193-9020-2-1

Bhorat, H., R. Kanbur, and B. Stanwix (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*, 96(5): 1402–19. https://doi.org/10.1093/ajae/aau049

Bhorat, H., R. Kanbur, and B. Stanwix (2017). 'Minimum Wages in Sub-saharan Africa: a Primer'. *World Bank Research Observer*, 32(1): 21–74. https://doi.org/10.1596/30139

Bhorat, H., R. Kanbur, B. Stanwix, and A. Thornton (2021). 'Measuring Multi-dimensional Labour Law Violation with an Application to South Africa'. *British Journal of Industrial Relations*, 59(3): 928–61. https://doi.org/10.1111/bjir.12580

Bitzer, V., A. Obi, and P. Ndou (2016). 'Keeping Up with Rising Quality Demands? New Institutional Arrangements, Upgrading and Market Access in the South African Citrus Industry'. In J. Bijman and V. Bitzer (eds), *Quality and Innovation in Food Chains*. Wageningen: Wageningen Academic Publishers. https://doi.org/10.3920/978-90-8686-825-4_7

Bossler, M., and H.D. Gerner (2020). 'Employment Effects of the New German Minimum Wage: Evidence from Establishment-level Microdata'. *ILR Review*, 73(5): 1070–94. https://doi.org/10.1177/0019793919889635

Breedt, L. (2005). 'Capital Investments on Citrus Export Farms in South Africa'. Unpublished Mimeo. Pretoria: University of Pretoria.

Brown, C., C. Kilroy, and A. Kohen (1982). 'The Effect of the Minimum Wage on Employment and Unemployment'. *Journal of Economic Literature,* 20(2): 487–528.

Burger, S. (2002). 'EUREPGAP – Are South African Farmers Really Sold?'. *Farmers Weekly*, 19 April.

Card, D. (1992a). 'Do Minimum Wages Reduce Employment? A Case Study of California, 1987-89'. *Industrial and Labor Relations Review,* 46(1): 38–54. https://doi.org/10.1177/001979399204600104

Card, D. (1992b). 'Using Regional Variation in Wages to Measure the Effects of the Federal Minimum Wage'. *Industrial and Labor Relations Review,* 46(1):22–37. https://doi.org/10.1177/001979399204600103

Card, D., and A.B. Krueger (1994). 'Minimum Wages and Employment: a Case Study of the Fast-food Industry in New Jersey and Pennsylvania'. *American Economic Review*, 84(4): 772–93.

Card, D., and A.B. Krueger (1995). *Myth and Measurement: the New Economics of the Minimum Wage*. Princeton, NJ: Princeton University Press.

Colen, L., M. Maertens, and J. Swinnen (2012). 'Private Standards, Trade and Poverty: GlobalGAP and Horticultural Employment in Senegal'. *World Economy*, 35(8): 1073–88. https://doi.org/10.1111/j.1467-9701.2012.01463.x

Darroch, M. (2010). 'South African Farmers' Perceptions of the Benefits and Costs of Complying with EUREPGAP to Export Fresh Citrus to the European Union (EU)'. Unpublished paper delivered at the Joint 3rd African Association of Agricultural Economists and the 48th Agricultural Economists Association of South Africa Conference. 19–23 September, Cape Town, South Africa.

Dolan, C., and J. Humphrey (2000). 'Governance and Trade in Fresh Vegetables: The Impact of UK Supermarkets on the African Horticulture Industry'. *The Journal of Development Studies*, 37(2): 147–76. https://doi.org/10.1080/713600072

Du, M. (2018). 'The Regulation of Private Standards in the World Trade Organization'. *Food and Drug Law Journal*, 73(s): 432–64.

Dube, A., T. Lester, and M. Reich (2010). 'Minimum Wage Effects Across State Borders: Estimates Using Contiguous Counties'. *The Review of Economics and Statistics*, 92(4): 945–64. https://doi.org/10.1162/REST_a_00039

Ehlert, C.R., D. Mithöfer, and H. Waibel (2014). 'Worker Welfare on Kenyan Export Vegetable Farms'. *Food Policy*, 46(2014): 66–73. https://doi.org/10.1016/j.foodpol.2014.01.004

Freguin-Gresh, S., and W. Anseeuw (2012). 'Integrating Smallholders into the Global Economy: Agri-businesses, Contracts and Public Policy in South Africa'. Unpublished paper delivered at the European IFSA Symposium. 1–4 July, Aarhus, Denmark.

Fuchs, D., A. Kalfagianni, and T. Havinga (2011). 'Actors in Private Food Governance: the Legitimacy of Retail Standards and Multistakeholder Initiatives with Civil Society Participation'. *Agriculture and Human Values*, 28(3): 353–67. https://doi.org/10.1007/s10460-009-9236-3

Garcia Martinez, M., and N. Poole (2004). 'The Development of Private Fresh Produce Safety Standards: Implications for Developing Mediterranean Exporting Countries'. *Food Policy*, 29(3): 229–55. https://doi.org/10.1016/j.foodpol.2004.04.002

GLOBALG.A.P. (2020). Data Enquiry: Statistics for South Africa, E-mail to A. Oshin, 18 September. GLOBALG.A.P. c/o FoodPLUS GmbH. Available e-mail: info@globgalgap.org.

GLOBALG.A.P. (2021). 'Integrated Farm Assurance Checklist'. [Online]. GLOBALG.A.P. c/o FoodPLUS GmbH. Available at: https://www.globalgap.org/what-we-offer/solutions/ifa-fruit-and-vegetables/ (accessed 3 June 2024).

GLOBALG.A.P. (2024). 'GLOBALG.A.P. for Producers'. [Online]. GLOBALG.A.P. c/o FoodPLUS GmbH. Available at: https://www.globalgap.org/producers/ (accessed 1 July 2024).

Graffham, A., E. Karehu, and J. MacGregor (2007). 'Impact of Eurepgap on Small-scale Vegetable Growers in Kenya'. Fresh Insights Number 6. London: International Institute for Environment and Development, London. Available at: https://www.gov.uk/research-for-development-outputs/fresh-insights-number-6-impact-of-eurepgap-on-small-scale-vegetable-growers-in-kenya (accessed 17 February 2025).

Grwambi, B. (2024). Personal Interview, 6 June.

Hanief, A. (2018). 'Enquiry: Exporting in South Africa, e-mail to A. Hanief'. [Online]. 11 June. Available e-mail: achmadh@ppecb.com.

Harasztosi, P., and A. Lindner (2019). 'Who Pays for the Minimum Wage?'. *American Economic Review*, 109(8): 2693–727. https://doi.org/10.1257/aer.20171445

Hau, H., Y. Huang, and G. Wang (2020). 'Firm Response to Competitive Shocks: Evidence from China's Minimum Wage Policy'. *The Review of Economic Studies*, 87(6): 2639–71. https://doi.org/10.1093/restud/rdz058

Henson, S. (2007). 'The Role of Public and Private Standards in Regulating International Food Markets'. *Journal of International Agricultural Trade and Development*, 4(1): 52–66.

Henson, S., and G. Holt (2000). 'Exploring Incentives for the Adoption of Food Safety Controls: HACCP Implementation in the U.K. Dairy Sector'. *Review of Agricultural Economics*, 22(2): 407–20.

Henson, S., and N. Hooker (2001). 'Private Sector Management of Food Safety: Public Regulation and the Role of Private Controls'. *The International Food and Agribusiness Management Review*, 4: 7–17. https://doi.org/10.1016/S1096-7508(01)00067-2

Henson, S., and J. Humphrey (2010). 'Understanding the Complexities of Private Standards in Global Agri-food Chains As they Impact Developing Countries'. *The Journal of Development Studies*, 46(9): 1628–46. https://doi.org/10.1080/00220381003706494

Henson, S., and J. Northen (1998). 'Economic Determinants of Food Safety Controls in Supply of Retailer Own-branded Products in United Kingdom'. *Agribusiness*, 14: 113–26. https://doi.org/10.1002/(SICI)1520-6297(199803/04)14:2<113::AID-AGR4>3.0.CO;2-5

Henson, S., and T. Reardon (2005). 'Private Agri-food Standards: Implications for Food Policy and the Agri-food System'. *Food Policy*, 30(3): 241–53. https://doi.org/10.1016/j.foodpol.2005.05.002

Hirsch, B., B. Kaufman, and T. Zelenska (2015). 'Minimum Wage Channels of Adjustment'. *Industrial Relations*, 54(2): 199–239. https://doi.org/10.1111/irel.12091

Hobbs, J. (2003). 'Incentives for the Adoption of Good Agricultural Practices'. FAO GAP Working Paper Series. Rome: Food and Agriculture Organisation.

Humphrey, J. (2008). 'Private Standards, Small Farmers and Donor Policy: EUREPGAP in Kenya'. IDS Working Paper 308. Brighton: Institute of Development Studies.

Humphrey, J., and H. Schmitz (2000). 'Governance and Upgrading: Linking Industrial Cluster and Global Value Chain Research'. IDS Working Paper 120. Brighton: Institute of Development Studies.

Jaffee, S. (2005). 'Food Safety and Agricultural Health Standards: Challenges and Opportunities for Developing Country Exports'. World Bank Report 31207. Available at: https://documents1.worldbank.org/curated/en/618321468780553085/pdf/31207.pdf (accessed 24 June 2024).

Jaffee, S., and S. Henson (2004). 'Standards and Agro-food Exports from Developing Countries: Rebalancing the Debate'. Working Paper 3348. Washington, DC: World Bank Group.

Jensen, M. (2004). *Developing New Exports from Developing Countries: New Opportunities and New Constraints*. Copenhagen: Department of Economics and Natural Resources, Royal Veterinary and Agricultural University.

Jooste, A., E. Kruger, and F. Kotze (2003). 'Standards and Trade in South Africa: Paving Pathways for Increased Market Access and Competitiveness'. In J. Wilson and V. Abiola (eds), *Standards and Global Trade: A Voice for Africa*. Washington DC: The World Bank.

Katz, L., and A. Krueger (1992). 'The Effect of the Minimum Wage on the Fast Food Industry'. NBER Working Paper 3997. Cambridge, MA: National Bureau of Research. Available at: https://www.nber.org/system/files/working_papers/w3997/w3997.pdf (accessed 26 July 2024).

Kerr, A. (2024). 'Earnings and Earnings Inequality in South Africa: Evidence from Household Survey and Administrative Tax Microdata from 1993 to 2020'. *Review of Income and Wealth*, Early View [Online].

Kerr, A., D. Lam, and M. Wittenberg (2019). *Post-apartheid Labour Market Series (Version 3.3)* [Online]. Available at: https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/434 (accessed 16 June 2024).

Kerr, A., and M. Wittenberg (2021). 'Union Wage Premia and Wage Inequality in South Africa'. *Economic Modelling*, 97: 255–71. https://doi.org/10.1016/j.econmod.2020.12.005

Krieger, S., and G. Schieffer (2005). 'Decision Support Model for the Optimization of Quality Systems in the Agri-food Industry'. Unpublished paper delivered at the 11th Seminar of the European Association of Agricultural Economists. 23–27 August, Copenhagen.

Levine, D.I., and M.W. Toffel (2010). 'Quality Management and Job Quality: How the ISO 9001 Standard for Quality Management Systems Affects Employees and Employers'. *Management Science*, 56(6): iv–1046. https://doi.org/10.1287/mnsc.1100.1159

Louw, R., and W. Van Dyk (2024). Personal Interview, 31 May.

Mabiletsa, P. (2003). 'Republic of South African: Citrus Annual Report'. Global Agriculture Information Network (GAIN) Report SF 3017. Available at: https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Citrus+Semi-Annual_Pretoria_South+Africa+-+Republic+of_06-17-2003.pdf (accessed 7 September 2024).

Machin, S., and A. Manning (1994). 'Minimum Wages, Wage Dispersion and Employment: Evidence from the UK Wages Councils'. *Industrial and Labor Relations Review,* 47(2): 319–29. https://doi.org/10.1177/001979399404700210

MaCurdy, T. (2015). 'How Effective is the Minimum Wage at Supporting the Poor?', *Journal of Political Economy*, 123(2): 497–545. https://doi.org/10.1086/679626

Maertens, M., and J. Swinnen (2009). 'Trade, Standards, and Poverty: Evidence from Senegal'. *World Development*, 37(1): 161–78. https://doi.org/10.1016/j.worlddev.2008.04.006

Maertens, M., and J. Swinnen (2012). 'Private Standards, Global Food Supply Chains and the Implications for Developing Countries'. In A. Marx, M. Maertens, J. Swinnen, and J. Wouters (eds), *Private Standards and Global Governance: Economic, Legal and Political Perspectives*. Cheltenham: Edward Elgar. https://doi.org/10.4337/9781849808750.00012

Marks and Spencer (n.d.). 'From Field to Fork – Our Farming Standards'. [Online]. Available at: https://corporate.marksandspencer.com/sustainability/reports-quick-reads/field-fork-our-farming-standards#:~:text=Good%20food%20starts%20with%20the%20farmerandtext=schemes.,fruit%2C%20veg%20and%20salad%20crops (accessed 5 July 2024).

Mayneris, F., S. Poncet, and T. Zhang (2018). 'Improving or Disappearing: Firm-level Adjustments to Minimum Wages in China'. *Journal of Development Economics*, 135: 20–42. https://doi.org/10.1016/j.jdeveco.2018.06.010

Methner, N., R. Hamann, and W. Nilsson (2015). 'The Evolution of a Sustainability Leader: the Development of Strategic and Boundary Spanning Organizational Innovation Capabilities in Woolworths'. In V. Bitzer, R. Hamann, M. Hall, and E. Nwosu (eds), *The Business of Social and Environmental Innovation: Frontiers in Research and Practice in Africa*. Berlin: Springer and Cape Town: UCT Press. https://doi.org/10.1007/978-3-319-04051-6_5

Ministry of Foreign Affairs of the Netherlands (2014). *What Requirements Should Fresh Fruit or Vegetables Comply with to Be Allowed on the European Market?* Center for the Promotion of Imports [Online]. Available at: https://web.archive.org/web/20150505235942/https://www.cbi.eu/market-information/fresh-fruit-vegetables/buyer-requirements (accessed 3 June 2024).

Ministry of Foreign Affairs of the Netherlands (2024). *What Requirements Should Fresh Fruit or Vegetables Comply with to Be Allowed on the European Market?* Center for the Promotion of Imports. [Online]. Available at: https://www.cbi.eu/market-information/fresh-fruit-vegetables/buyer-requirements (accessed 3 June 2024).

Mkhwanazi, M. (2019). 'Weather Data, E-mail to M. Mkhwanazi', 30 August. Available E-mail: Musa.Mkhwanazi@Weathersa.Co.Za.

Mullahy, J. and E.C. Norton (2022). 'Why Transform Y? a Critical Assessment of Dependent-variable Transformations in Regression Models for Skewed and Sometimes-zero Outcomes'. NBER Working Paper 30735. Cambridge: MA NBER. https://doi.org/10.3386/w30735

Mullahy, J., and E. Norton (2023). 'Why Transform Y? The Pitfalls of Transformed Regressions with a Mass at Zero'. *Oxford Bulletin of Economics and Statistics*, 86(2): 417–47. https://doi.org/10.1111/obes.12583

Munguía Corella, L. (2020). 'The mixed effects of minimum wage in imperfect labor markets'. Unpublished Doctoral dissertation. Irvine, CA: University of California Irvine.

National Treasury and UNU-WIDER (2023a). 'Customs Export Transactional-Level Data. 2008–2022 [dataset]. Extraction 5, Version 1'. Pretoria: South African Revenue Service [producer of the original data]. Pretoria: National Treasury and UNU-WIDER [producer and distributor of the harmonized dataset].

National Treasury and UNU-WIDER (2023b). 'IRP5 2008–2022 [dataset]. Version 5 beta'. Pretoria: South African Revenue Service [producer of the original data]. Pretoria: National Treasury and UNU-WIDER [producer and distributor of the harmonized dataset].

Neumark, D., and L. Munguía Corella (2021). 'Do Minimum Wages Reduce Employment in Developing Countries? a Survey and Exploration of Conflicting Evidence'. *World Development*, 137: 1–23. https://doi.org/10.1016/j.worlddev.2020.105165

Neumark, D., and W. Wascher (2000). 'The Effect of New Jersey's Minimum Wage Increase on Fast-food Employment: A Revision Using Payroll Records'. *American Economic Review,* 90(5): 1362–96.

Neumark, D., and W. Wascher (2010). *Minimum Wages*. Cambridge, MA: MIT Press.

Newman, C., J. Rand, F. Tarp, and N. Trifković (2018). 'The Transmission of Socially Responsible Behaviour Through International Trade'. *European Economic Review*, 101: 250–67. https://doi.org/10.1016/j.euroecorev.2017.10.013

Okello, J. (2005). 'Compliance with International Food Safety Standards: the Case of Green Bean Production in Kenyan Family Farms'. Unpublished Doctoral thesis. Michigan: Michigan State University. Available at: https://d.lib.msu.edu/etd/34022 (accessed 1 July 2024).

Ortiz, S., and S. Aparicio (2007). 'How Labourers Fare in Fresh Fruit Export Industries: Lemon Production in Northern Argentina'. *Journal of Agrarian Change*, 7: 382–404. https://doi.org/10.1111/j.1471-0366.2007.00150.x

Piek, M., and D. Von Fintel (2020). 'Sectoral Minimum Wages in South Africa: Disemployment by Firm Size and Trade Exposure'. *Development Southern Africa*, 37(3): 462–82. https://doi.org/10.1080/0376835X.2019.1702504

Piek, M., D. Von Fintel, and J. Kirsten (2023). 'The Impact of Agricultural Minimum Wages on Worker Flows in South Africa'. *South African Journal of Economics*, 91(4): 446–65. https://doi.org/10.1111/saje.12357

Pieterse, D., E. Gavin, and C.F. Kreuser (2018). 'Introduction to the South African Revenue Service and National Treasury Firm-level Panel'. *South African Journal of Economics*, 86(S1): 6–39. https://doi.org/10.1111/saje.12156

Rani, U., P. Belser, M. Oelz, and S. Ranjbar (2013). 'Minimum Wage Coverage and Compliance in Developing Countries'. *International Labour Review*, 152(3): 381–410. https://doi.org/10.1111/j.1564-913X.2013.00197.x

Reardon, T., and E. Farina (2002). 'The Rise of Private Food Quality and Safety Standards: Illustrations from Brazil'. *International Food and Agribusiness Management Review*, 4(4): 413–21. https://doi.org/10.1016/S1096-7508(02)00067-8

Red Tractor (2021). 'Fresh Produce Standards'. [Online]. Available at: https://redtractorassurance.org.uk/wp-content/uploads/2021/08/RTStandardsV5_FreshProduce_SINGLES.pdf (accessed 5 July 2024).

Republic of South Africa (2006). 'Basic Conditions of Employment Act 75 of 1997: Sectoral Determination 13, Farm Worker Sector, South Africa'. *Government Gazette,* 28518, 17 February. Available at: https://www.gov.za/sites/default/files/gcis_document/201409/28518.pdf (accessed 3 June 2024).

Republic of South Africa (2012). 'Basic Conditions of Employment Act 75 of 1997: Investigation into the Farm Worker Sector, South Africa'. *Government Gazette* 35878, 15 November. Available at: https://www.saflii.org/za/gaz/ZAGovGaz/2012/858.pdf accessed 3 June 2024).

Republic of South Africa (2013). 'Basic Conditions of Employment Act 75 of 1997: Sectoral Determination 13, Farm Worker Sector, South Africa'. *Government Gazette* 36115, 5 February. Available at: https://cisp.cachefly.net/assets/articles/attachments/43570_n65.pdf (accessed 3 June 2024).

SAGAP (2011). 'Standards Regarding Food Safety and Food Hygiene of Regulated Agricultural Food Products of Plant Origin Destined for Export'. [Online]. Available at: https://old.dalrrd.gov.za/Branches/Agricultural-Production-Health-Food-Safety/Food-Safety-Quality-Assurance/Food-Safety (accessed 17 July 2024).

Schwartz, M.S., and A.B. Carroll (2003). 'Corporate Social Responsibility: A Three-domain Approach'. *Business Ethics Quarterly*, 13(4): 503–30. https://doi.org/10.5840/beq200313435

South African History Online (2019). 'The Western Cape Farm Workers Strike 2012–2013'. [Online]. Available at: https://www.sahistory.org.za/article/western-cape-farm-workers-strike-2012-2013 (accessed 3 June 2024).

SARS (n.d.a). 'Customs Declaration Form CD1'. South African Revenue Service. [Online]. Available at: https://www.wylie.co.za/wp-content/uploads/due-date-2013-05-27-draft-customs-declaration-form-cd-1.pdf (accessed 4 June 2024).

SARS (n.d.b). 'SAD500 Customs Declaration Form'. South African Revenue Service. [Online]. Available at: https://www.sars.gov.za/wp-content/uploads/Ops/Forms/SAD-500-Customs-Declaration-Form-External-Form.pdf (accessed 4 June 2024).

Stigler, G. (1946). 'The Economics of Minimum Wage Legislation'. *American Economic Review*, 36(3): 358–65.

Tan, B. (2021). 'The Minimum Wage and Firm Networks: Evidence from South Africa'. WIDER Working Paper 2021/100. Helsinki: UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/2021/040-5

Tesco (2020). 'Our Food Quality Story'. [Online]. Available at: https://www.tescoplc.com/media/757621/our-food-quality-story_a4_aw_digital-1.pdf (accessed 5 July 2024).

Thorstensen, V., R. Weissinger, and X. Sun (2015). *E15 Initiative on Regulatory Systems Coherence: Private Standards, Implications for Trade, Development and Governance.* Geneva: International Centre for Trade and Sustainable Development (ICTSD) and World Economic Forum.

Trifković, N. (2017). 'Spillover Effects of International Standards: Working Conditions in the Vietnamese SMEs'. *World Development*, 97: 79–101. https://doi.org/10.1016/j.worlddev.2017.03.040

Tung, O. (2016). 'Organic Food Certification in South Africa: A Private Sector Mechanism in Need of State Regulation?'. *Potchefstroom Electronic Law Journal*, 19(1): 1–48. https://doi.org/10.17159/1727-3781/2016/v19i0a584

Turner, C., G. Ortmann, and M. Lyne (2000). 'Adoption of ISO 9000 Quality Assurance Standards by South African Agribusiness Firms'. *Agribusiness: An International Journal,* 16(3): 295–307. https://doi.org/10.1002/1520-6297(200022)16:3<295::AID-AGR3>3.0.CO;2-P

Unnevehr, L. (2000). 'Food Safety Issues and Fresh Food Product Exports from LDCs'. *Agricultural Economics*, 23(3): 231–40. https://doi.org/10.1111/j.1574-0862.2000.tb00275.x

Van der Zee, K. (2017). 'Assessing the Effects of Two Agricultural Minimum Wage Shocks in South Africa'. Unpublished Master's thesis. Cape Town: University of Cape Town. Available at: https://open.uct.ac.za/handle/11427/25504 (accessed 10 July 2018).

Vermeulen, H., D. Jordaan, L. Korsten, and J. Kirsten (2006). 'Private Standards, Handling, and Hygiene in Fruit Export Supply Chains: A Preliminary Evaluation of the Economic Impact of Parallel Standards'. Working Paper 2006:01. Pretoria: Department of Agricultural Economics, University of Pretoria, South Africa.

Wilson, J., and V. Abiola (2004). *Standards and Global Trade: A Voice for Africa.* Washington DC: The World Bank.

World Customs Organization (n.d.). 'Harmonized System'. [Online]. Available at: https://www.wcotradetools.org/en/harmonized-system (accessed 4 June 2024).

World Trade Organization (2009). *Effects of SPS-related private standards–Compilation of replies, G/SPS/GEN/932/Rev.1.* Available at: https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=Q:/G/SPS/GEN932.pdf&Open=True (accessed 24 June 2024).

Yiridoe, E., J. Clark, G. Marret, R. Gordon, and P. Duinker (2003). 'ISO 14001 EMS Standard Registration Decisions Among Canadian Organisations'. *Agribusiness: An International Journal*, 19(4): 439–57. https://doi.org/10.1002/agr.10069

Zaibet, L., and M. Bredahl (1997). 'Gains from ISO Certification in the UK Meat Sector'. *Agribusiness: An International Journal*, 13(4): 375–84. https://doi.org/10.1002/(SICI)1520-6297(199707/08)13:4<375::AID-AGR3>3.0.CO;2-W

Appendix

Table A1: Number of producers with GLOBALG.A.P. certified production processes by product type in South Africa

Year	Flowers and ornamentals	Aquaculture	Livestock	Fruit and vegetables
2009	1	0	0	1,857
2010	2	0	0	1,764
2011	2	0	0	1,882
2012	3	0	0	1,795
2013	3	0	0	1,959
2014	3	0	0	2,047
2015	3	0	0	2,019
2016	3	0	0	1,960
2017	3	0	0	2,087
2018	1	0	0	1,857

Note: all figures as on 31 December of the particular year.

Source: authors' presentation based on communication with GLOBALG.A.P. (2020).

Table A2: Destination countries outside of the EU and SADC

Not to EU and SADC	United Kingdom, Hong Kong, United Arab Emirates, Canada, Bahrain, Nigeria, Ghana, Saudi Arabia, Singapore, Malaysia, Viet Nam, Benin, Egypt, China, Taiwan, Senegal, Bangladesh, Eswatini, United States, Russian Federation, Kenya, Kuwait, Philippines, Switzerland, Australia, Indonesia, Iran, Israel, Japan, Lebanon, Oman, Thailand, Ukraine
Highest amount not to EU and SADC	United Kingdom, United States, United Arab Emirates, Japan, Russian Federation, Hong Kong, Canada, Ukraine, Singapore, Iran, China, Malaysia, Saudi Arabia, Kuwait, Viet Nam, Senegal, Ghana, South Korea, Nigeria, Indonesia, Egypt, Taiwan, Eswatini, Israel, Australia
Most frequently not to EU and SADC	United Kingdom, Russian Federation, Saudi Arabia, Hong Kong, Malaysia, United Arab Emirates, Canada, Nigeria, China, South Korea, Bangladesh, Viet Nam, United States, Ghana, Uganda, Singapore, Congo, Taiwan, Egypt, Eswatini, Israel, Australia

Note: the table shows the countries that farmers in South Africa export to outside of the EU and SADC. Countries are listed from most frequently exported to to least exported to. Only farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and exports without the use of an intermediary were included in the sample. Moreover, the sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own calculations using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A3: HS6 codes used and their description

HS6 codes	HS6 description
070110-070999 080110-080610 080711-081090	Seed potatoes; Other potatoes, fresh or chilled; Tomatoes, fresh or chilled; Onions and shallots, fresh or chilled; Garlic, fresh or chilled; Leeks and other alliaceous vegetables, n.e.s.; Cauliflowers and headed broccoli, fresh or chilled; Brussel sprouts, fresh or chilled; White and red cabbage, kohlrabi, kale, etc; Cabbage lettuce, fresh or chilled; Lettuce, fresh or chilled; Witloof chicory, fresh or chilled; Chicory, fresh or chilled, (excl. witloof); Carrots and turnips, fresh or chilled; Beetroot...radishes and other similar edible roots; Cucumbers and gherkins, fresh or chilled; Peas, fresh or chilled; Beans, fresh or chilled; Leguminous vegetables, fresh or chilled, n.e.s.; Globe artichokes, fresh or chilled; Asparagus, fresh or chilled; Aubergines., fresh or chilled; Celery, fresh or chilled; Mushrooms, fresh or chilled; Truffles, fresh or chilled; Fruits of genus Capsicum or Pimenta, fresh or c; Spinach, fresh or chilled; Other vegetables, fresh or chilled, n.e.s.; Other vegetables, fresh or chilled; Coconuts, fresh or dried; Cashew nuts, fresh or dried; Almonds without shells, fresh or dried; Hazelnuts without shells, fresh or dried; Walnuts without shells, fresh or dried; Pistachio, fresh or dried; Bananas, including plantains, fresh or dried; Figs, fresh or dried; Avocados, fresh or dried; Oranges, fresh or dried; Lemons and limes, fresh or dried; Lemons and limes; Citrus fruit, fresh or dried, n.e.s.; Brazil nuts, fresh or dried; Almonds in shell, fresh or dried; Hazelnuts in shell, fresh or dried; Walnuts in shell, fresh or dried; Chestnuts, fresh or dried; Other nuts, fresh or dried, n.e.s.; Dates, fresh or dried; Pineapples, fresh or dried; Guavas, mangoes and mangosteens, fresh or dried; Mandarins, clementines etc; Grapefruit, fresh or dried; Fresh grapes; Melons and watermelons, fresh; Papaws (papayas), fresh; Pears and quinces, fresh; Cherries, fresh; Plums and sloes, fresh; Raspberries, blackberries, mulberries and logan; Cranberries, mulberries etc; Apples, fresh; Apricots, fresh; Peaches, including nectarines, fresh; Strawberries, fresh; Black, white or red currants and gooseberries; Other fruit, fresh, n.e.s.

Note: n.e.s stands for not elsewhere specified.

Source: World Customs Organization (n.d.).

Table A4: Number of agricultural firms in the IRP5 data between 2007/08 and 2016/17

Tax year	Firms in agriculture	Year-on-year percentage change
2007/08	1,201	-
2008/09	1,363	13%
2009/10	4,547	234%
2010/11	5,858	29%
2011/12	6,267	7%
2012/13	6,594	5%
2013/14	6,864	4%
2014/15	7,205	5%
2015/16	7,522	4%
2016/17	7,798	4%

Source: own calculations using version 5 (beta) of the IRP5 data (National Treasury and UNU-WIDER 2023b).

Table A5: Total customs value of fresh fruit and vegetable(ffv) exports

	Total customs ffv exports:	
	Exported by farmers without an intermediary and primarily exported ffv	Of all ffv exports
2010/11	4,823,777,362 (31%)	15,702,436,327
2011/12	4,752,895,329 (27%)	17,420,896,819
2012/13	5,251,891,306 (26%)	20,065,974,910
2013/14	3,805,719,540 (15%)	25,890,296,012
2014/15	6,215,355,105 (20%)	31,564,811,701
2015/16	8,183,109,278 (21%)	38,067,976,689
2016/17	9,338,204,816 (22%)	42,488,356,388

Note: column 1 consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and export without the use of an intermediary. Moreover, the sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices. Column 2 includes all fresh fruit and vegetable exports from South Africa with no restrictions placed on the sample.

Source: own calculations using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A6: Descriptive statistics for farmers who export to the UK

	No. of farms that export:			No. of jobs on farms that export:			Customs value (in ZAR1m) of ffv exports to:		
	to UK	highest amount to UK	most frequently to UK	to UK	highest amount to UK	most frequently to UK	to UK	highest amount to UK	most frequently to UK
2010/11	40	17	17	25,872	9,202	8,502	4,565	766	750
2011/12	41	19	18	24,848	11,456	7,797	4,424	447	2,462
2012/13	40	15	17	22,093	12,129	8,941	4,658	654	736
2013/14	37	14	16	21,518	10,633	11,238	3,157	608	945
2014/15	38	13	13	27,425	10,834	8,295	5,241	1,424	1,037
2015/16	42	14	15	32,113	13,222	7,441	6,543	2,201	1,506
2016/17	47	16	17	32,498	11,470	8,437	7,662	2,064	1,696

Note: the sample includes farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and export without the use of an intermediary. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A7: Regression results – minimum wage effect on the odds of farmers' exporting stance

	Unweighted	Weighted
Fraction affected (FA)	0.133	0.062
	(0.429)	(0.756)
2012/13	1.220**	1.138
	(0.595)	(0.957)
2013/14	0.627	0.102
	(0.422)	(0.618)
2014/15	0.193	0.039
	(0.422)	(0.612)
2015/16	0.484	0.068
	(0.477)	(0.777)
2016/17	0.702	0.347
	(0.442)	(0.506)
2012/13 x FA	-1.149	-0.824
	(0.726)	(1.148)
2013/14 x FA	-0.273	-0.301
	(0.528)	(0.768)
2014/15 x FA	-0.245	0.47
	(0.583)	(0.98)
2015/16 x FA	-0.692	-0.262
	(0.587)	(1.337)
2016/17 x FA	-0.664	-0.219
	(0.579)	(0.808)
Share of year worked †	-0.590**	-1.193***
	(0.234)	(0.443)
Proportion male †	-1.043***	-0.813
	(0.245)	(0.65)
Workers' age †	-0.003	-0.02
	(0.011)	(0.033)
Rainfall	-0.001**	0.001
	(0)	(0.001)
Lagged dep. variable	6.069***	5.325***
	(0.189)	(0.345)
Constant	-2.974***	-2.439*
	(0.548)	(1.254)
Pseudo R-squared	0.677	0.639
N	9855	9855

Note: these regression results correspond to Figure 3 in the main text. The level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A logit regression was used, and pre-policy firm size (in terms of the number of jobs) was used in the weighted regression. Standard errors were clustered at the firm level and are shown in parentheses. The dependent variable is a binary variable to indicate whether a farm exports or not. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the average workers' age. The sample consists of crop and fruit farmers who existed in 2011/12, irrespective of their export status. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices. ***p<0.01, **p<0.05, *p<0.1. † indicates pre-policy values.

Source: own calculations using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A8: Unweighted results – minimum wage effect on farmers' export destinations that predominantly export fruit and vegetables

	Export:								
	to EU	highest amount to EU	most frequently to EU	to SADC	highest amount to SADC	most frequently to SADC	not to EU and SADC	highest amount not to EU and SADC	most frequently not to EU and SADC
Fraction affected (FA)	2.575***	1.457	1.618	-1.623	-3.205	-3.091	-2.640***	-0.606	-0.626
	(0.86)	(1.352)	(1.322)	(1.078)	(1.971)	(3.445)	(0.808)	(0.873)	(1.113)
2012/13	1.601	0.893	1.538	-1.245	-6.968**	-5.949**	-0.327	0.036	0.33
	(1.332)	(2.093)	(1.496)	(1.826)	(3.348)	(2.437)	(0.298)	(1.428)	(0.883)
2013/14	3.066**	0.269	2.623**	-0.947	-3.429	-0.409	-2.828	0.509	-1.795*
	(1.509)	(1.347)	(1.337)	(0.833)	(2.324)	(1.598)	(1.724)	(0.809)	(0.975)
2014/15	-0.463	0.209	0.001	-0.781	-2.959*	-1.558	1.034	0.375	0.696
	(1.178)	(1.46)	(2.237)	(0.903)	(1.589)	(1.337)	(1.277)	(0.808)	(2.091)
2015/16	0.533	-0.049	0.027	-2.486*	-0.53	0.143	-2.22	-0.287	-0.551
	(3.035)	(2.289)	(1.578)	(1.364)	(1.466)	(1.466)	(1.586)	(1.139)	(1.256)
2016/17	-1.155	-1.32	1.756	0.375	-1.249	-1.525	1.721	1.52	-0.775
	(1.229)	(1.805)	(1.452)	(0.953)	(1.26)	(1.154)	(1.142)	(1.067)	(1.222)
2012/13 x FA	-3.286**	-0.445	-2.39	2.181	8.563**	5.722	3.102***	-0.663	0.529
	(1.281)	(2.348)	(1.766)	(2.204)	(3.906)	(4.878)	(1.104)	(1.625)	(1.179)
2013/14 x FA	-5.374***	-0.555	-2.323	1.829	6.818*	2.935	4.861**	-0.67	0.75
	(1.864)	(1.605)	(1.696)	(1.209)	(3.764)	(3.683)	(2.223)	(1.047)	(1.363)
2014/15 x FA	-1.473	-0.813	-0.756	1.292	3.231*	3.331	0.928	0.034	-0.36
	(1.562)	(1.689)	(2.515)	(1.472)	(1.95)	(3.456)	(1.751)	(1.062)	(2.407)
2015/16 x FA	-0.957	0.111	-0.198	3.558*	2.639	1.904	3.951*	-0.069	0.268
	(3.491)	(2.606)	(1.94)	(1.87)	(2.162)	(3.618)	(2.2)	(1.446)	(1.631)
2016/17 x FA	0.946	1.605	-1.916	-1.442	-0.027	-1.993	-0.4	-1.65	1.588
	(1.843)	(2.118)	(1.827)	(1.352)	(3.601)	(3.225)	(2.091)	(1.375)	(1.569)
% of year worked †	-0.639	-0.314	0.193	-0.712	1.089	-0.212	0.941	0.214	-0.13
	(0.661)	(0.638)	(0.694)	(0.665)	(1.226)	(0.881)	(0.994)	(0.639)	(0.686)
Proportion male †	-0.627	-0.049	1.383*	0.071	-1.646	-0.233	0.833	-0.553	-1.488*
	(0.798)	(0.63)	(0.801)	(0.634)	(1.321)	(0.912)	(0.873)	(0.641)	(0.774)

Workers' age †	0.017	-0.016	-0.05	0.044	0.051	0.02	-0.047	0.012	0.034
	(0.04)	(0.033)	(0.041)	(0.035)	(0.05)	(0.046)	(0.048)	(0.029)	(0.041)
Rainfall	-0.002	-0.001	-0.001	-0.002	-0.006**	0	0.002	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)
Lagged dep. var.	5.596***	3.168***	4.343***	4.717***	10.729***	7.855***	5.510***	3.309***	4.216***
	(0.604)	(0.391)	(0.479)	(0.596)	(1.944)	(1.376)	(0.653)	(0.412)	(0.43)
Constant	-2.371*	-1.288	-1.991	-1.508	-1.655	-2.994	-3.677**	-2.493*	-2.639*
	(1.35)	(1.475)	(1.594)	(1.305)	(2.105)	(2.084)	(1.79)	(1.314)	(1.488)
Pseudo R-squared	0.657	0.375	0.505	0.538	0.816	0.719	0.580	0.375	0.483
N	372	372	372	372	372	372	372	372	372

Note: the level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A logit regression was used, and the results were not weighted. Standard errors were clustered at the firm level and are shown in parentheses. The dependent variables in the successive columns are binary variables to indicate whether a farm i) exports to a specific region, ii) exports its highest export amount to a specific region, and iii) exports most frequently to a specific region. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the average workers' age. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices. ***p<0.01, **p<0.05, *p<0.1. † indicates pre-policy values.

Source: own calculations using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A9: Weighted results – minimum wage effect on export destinations of farmers that predominantly export fruit and vegetables

	Export:								
	to EU	highest amount to EU	most frequently to EU	to SADC	highest amount to SADC	most frequently to SADC	not to EU and SADC	highest amount not to EU and SADC	most frequently not to EU and SADC
Fraction affected (FA)	6.066***	7.967	5.278**	-1.921	-2.136	-4.63	-5.987***	-5.822**	-3.688***
	(1.63)	(5.26)	(2.119)	(1.189)	(1.762)	(3.422)	(1.65)	(2.743)	(1.039)
2012/13	5.532*	7.426	2.853	-1.65	-11.423***	-6.790***	-0.576	-4.363	-0.492
	(3.052)	(4.992)	(1.938)	(1.799)	(3.409)	(2.635)	(0.643)	(2.868)	(0.577)
2013/14	10.037***	5.709	7.227***	-0.68	-3.109	-8.445	-8.845***	-3.872*	-5.535***
	(2.481)	(4.494)	(2.239)	(0.998)	(4.766)	(6.541)	(2.477)	(2.131)	(1.56)
2014/15	-1.013	4.861	-0.35	-1.235	-3.524**	-1.201	3.130*	-2.686	1.875
	(1.842)	(4.29)	(1.71)	(1.01)	(1.537)	(1.255)	(1.704)	(2.007)	(1.196)
2015/16	5.771**	1.49	-11.562*	-1.865	-1.38	-0.516	-3.261**	-1.909	-0.095
	(2.449)	(5.704)	(5.991)	(1.332)	(1.512)	(1.348)	(1.581)	(2.567)	(1.943)
2016/17	-0.505	4.294	3.992*	-1.176	-0.716	-2.107	3.087**	-2.346	-2.357*
	(1.964)	(4.864)	(2.167)	(0.947)	(1.221)	(1.447)	(1.434)	(2.512)	(1.283)
2012/13 x FA	-8.444**	-8.523	-4.919**	3.928**	14.213***	9.196*	4.537**	4.027	2.078**
	(3.336)	(5.584)	(2.205)	(1.883)	(3.697)	(4.801)	(2.181)	(3.315)	(1.026)
2013/14 x FA	-13.744***	-7.027	-8.023***	1.254	6.769	12.923	13.587***	4.344	5.168***
	(2.923)	(5.166)	(2.613)	(1.227)	(5.569)	(9.759)	(3.274)	(2.72)	(1.839)
2014/15 x FA	-0.184	-6.246	-0.736	2.36	3.910**	3.965	-1.203	3.72	-1.476
	(3.135)	(4.868)	(2.488)	(1.502)	(1.814)	(3.247)	(2.68)	(2.452)	(2.16)
2015/16 x FA	-8.024***	-2.308	11.678*	4.457*	4.059**	3.415	9.365***	2.448	0.223
	(2.935)	(6.472)	(6.737)	(2.338)	(1.818)	(3.56)	(2.621)	(3.155)	(2.303)
2016/17 x FA	-1.037	-5.281	-5.503**	1.215	-0.728	1.269	0.664	3.492	4.247**
	(2.405)	(5.505)	(2.505)	(1.455)	(3.573)	(2.398)	(2.658)	(2.999)	(1.722)
% of year worked †	-2.865**	-1.016	-0.078	-0.116	2.901	-1.865	4.065**	0.534	0.428
	(1.143)	(1.11)	(0.987)	(0.782)	(1.856)	(1.768)	(1.729)	(1.074)	(0.979)
Proportion male †	-2.771*	0.74	2.563*	0.525	-6.697	0.906	1.903	-2.678	-4.278***
	(1.669)	(1.648)	(1.489)	(1.336)	(4.199)	(1.421)	(1.61)	(1.795)	(1.577)

Workers' age †	0.12	0.073	0.154	0.003	0.234	0.065	-0.161*	-0.091	-0.200*
	(0.117)	(0.106)	(0.107)	(0.076)	(0.146)	(0.187)	(0.097)	(0.107)	(0.111)
Rainfall	-0.003	-0.001	-0.004**	0	-0.013**	-0.001	0.007***	0.004**	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.006)	(0.002)	(0.002)	(0.002)	(0.002)
Lagged dep. var.	6.492***	4.644***	5.410***	3.601***	13.513***	8.122***	5.945***	4.209***	5.391***
	(0.838)	(0.694)	(0.819)	(0.884)	(2.134)	(2.013)	(0.805)	(0.664)	(0.736)
Constant	-5.634	-10.026	-9.579***	-1.299	-4.666	-3.175	-4.303	3.516	4.003
	(3.991)	(5.845)	(3.672)	(2.214)	(3.402)	(5.749)	(2.913)	(4.366)	(3.282)
Pseudo R-squared	0.745	0.600	0.674	0.385	0.894	0.774	0.649	0.573	0.667
N	372	372	372	372	372	372	372	372	372

Note: the level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A logit regression was used, and the results were weighted using pre-policy firm size (in terms of the number of jobs). Standard errors were clustered at the firm level and are shown in parentheses. The dependent variables in the successive columns are binary variables to indicate whether a farm i) exports to a specific region, ii) exports its highest export amount to a specific region, and iii) exports most frequently to a specific region. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the average workers' age. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices. ***p<0.01, **p<0.05, *p<0.1. † indicates pre-policy values.

Source: own calculations using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A10: Unweighted regressions – minimum wage effect on employment growth within farms that predominantly export fruit and vegetables

	Export:								
	to EU	highest amount to EU	most frequently to EU	to SADC	highest amount to SADC	most frequently to SADC	not to EU and SADC	highest amount not to EU and SADC	most frequently not to EU and SADC
Fraction affected (FA)	0.343	0.565	0.673*	-0.18	-0.846***	-0.696**	-0.763*	-0.396	-0.553
	(0.264)	(0.365)	(0.371)	(0.227)	(0.29)	(0.273)	(0.439)	(0.351)	(0.34)
2012/13	-0.261	-0.369	-0.173	-0.113	-0.109	0.236	-0.297	-0.252	-0.275
	(0.24)	(0.329)	(0.322)	(0.284)	(0.235)	(0.347)	(0.549)	(0.375)	(0.364)
2013/14	0.06	0.358	0.341	-0.242	-0.449	-0.573	-1.026**	-0.650*	-0.754**
	(0.184)	(0.245)	(0.238)	(0.306)	(0.737)	(0.771)	(0.45)	(0.364)	(0.371)
2014/15	0.15	0.672	0.479	0.027	-0.646*	-0.629*	-0.473	-0.345	-0.343
	(0.213)	(0.546)	(0.386)	(0.166)	(0.37)	(0.328)	(0.434)	(0.33)	(0.324)
2015/16	0.768	-0.772*	-0.592	-0.111	-0.161	-0.138	-0.720*	0.03	-0.011
	(0.995)	(0.444)	(0.409)	(0.263)	(0.471)	(0.439)	(0.437)	(0.814)	(0.801)
2016/17	-0.184	-0.056	-0.103	-0.303	-1.771***	-1.655***	-0.749	-0.587	-0.622*
	(0.146)	(0.209)	(0.232)	(0.186)	(0.5)	(0.424)	(0.58)	(0.374)	(0.369)
2012/13 x FA	0.323	0.358	0.181	0.095	0.127	-0.405	0.541	0.376	0.502
	(0.436)	(0.592)	(0.612)	(0.409)	(0.329)	(0.435)	(0.683)	(0.447)	(0.435)
2013/14 x FA	-0.3	-0.767*	-0.884**	0.129	0.143	0.223	1.302*	0.784*	1.232**
	(0.306)	(0.414)	(0.408)	(0.39)	(0.854)	(0.885)	(0.665)	(0.471)	(0.488)
2014/15 x FA	-0.353	-1.040*	-0.848*	-0.023	0.928*	0.765*	0.267	0.343	0.49
	(0.302)	(0.624)	(0.473)	(0.25)	(0.496)	(0.434)	(0.799)	(0.412)	(0.416)
2015/16 x FA	-1.049	0.357	0.139	0.255	0.503	0.337	0.572	0.066	0.282
	(1.087)	(0.602)	(0.563)	(0.369)	(0.573)	(0.529)	(0.584)	(0.909)	(0.881)
2016/17 x FA	-0.053	-0.283	-0.291	0.276	2.340***	1.877***	0.835	0.553	0.765*
	(0.277)	(0.399)	(0.396)	(0.255)	(0.722)	(0.488)	(0.756)	(0.459)	(0.444)
Share of year worked †	0.454***	0.389**	0.365**	0.068	-0.422	-0.338	-0.022	0.265	0.325*
	(0.163)	(0.166)	(0.178)	(0.118)	(0.289)	(0.241)	(0.411)	(0.194)	(0.171)
Proportion male †	0.301	0.567**	0.481*	0.12	0.261	0.284	-0.408	-0.263	-0.255
	(0.212)	(0.272)	(0.285)	(0.131)	(0.195)	(0.179)	(0.342)	(0.226)	(0.172)
Workers' age †	0.005	0.013	0.008	-0.017*	-0.008	-0.014	0.029**	0.004	0.005
	(0.01)	(0.014)	(0.013)	(0.009)	(0.021)	(0.021)	(0.014)	(0.013)	(0.011)

Rainfall	-0.000**	-0.001***	-0.001**	0	0.001**	0.001**	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0.001)	(0)	(0)
Constant	-0.216	-0.529	-0.444	0.48	0.535	0.684	-0.055	0.148	0.134
	(0.382)	(0.489)	(0.503)	(0.352)	(0.609)	(0.591)	(0.609)	(0.506)	(0.455)
Ln (alpha)	-1.418***	-0.529	-1.277***	-1.952***	-2.123***	-2.307***	-1.657***	-1.917***	-1.909***
	(0.276)	(0.489)	(0.298)	(0.308)	(0.583)	(0.626)	(0.255)	(0.347)	(0.342)
Pseudo R-squared	0.018	0.024	0.025	0.006	0.031	0.030	0.029	0.014	0.018
N	262	170	164	141	53	60	49	149	148

Note: the level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A negative binomial regression was used, and the results were not weighted. The dependent variable in the successive columns is the number of jobs in farms that i) export to a specific region, ii) export their highest export amount to a specific region, and iii) export most frequently to a specific region. The exposure variable is the firm size in the prior year, and as such we model year-on-year employment growth as explained in Section 4.2. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level and shown in parentheses. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices. ***p<0.01, **p<0.05, *p<0.1. † indicates pre-policy values.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A11: Weighted regressions – minimum wage effect on employment growth within farms that predominantly export fruit and vegetables

	Export:								
	to EU	highest amount to EU	most frequently to EU	to SADC	highest amount to SADC	most frequently to SADC	not to EU and SADC	highest amount not to EU and SADC	most frequently not to EU and SADC
Fraction affected (FA)	0.099	0.277	0.33	-0.272	-0.444***	-0.587***	-0.256	-0.039	-0.219
	(0.162)	(0.239)	(0.284)	(0.323)	(0.094)	(0.085)	(0.241)	(0.141)	(0.242)
2012/13	-0.261	0.012	0.201	-0.400**	0.127	0.075	0.316	0.086	0
	(0.19)	(0.248)	(0.343)	(0.186)	(0.262)	(0.301)	(0.376)	(0.334)	(0.304)
2013/14	-0.103	0.416	0.254	-0.440**	-1.220**	-1.278***	-0.585	-0.409***	-0.642***
	(0.171)	(0.254)	(0.241)	(0.208)	(0.542)	(0.485)	(0.517)	(0.152)	(0.141)
2014/15	0.238	0.465	0.481	-0.053	-0.271	-0.378**	0.059	-0.011	-0.053
	(0.281)	(0.283)	(0.295)	(0.144)	(0.172)	(0.156)	(0.239)	(0.114)	(0.113)
2015/16	-0.156	3.491	3.142	-0.048	-1.190***	-0.875***	-0.22	-0.263***	-0.321***
	(0.296)	(4.729)	(5.159)	(0.387)	(0.272)	(0.228)	(0.155)	(0.094)	(0.097)
2016/17	-0.219**	-0.157	-0.165	-0.366**	-0.274	-0.548	-0.165	-0.223*	-0.278**
	(0.089)	(0.28)	(0.355)	(0.187)	(0.393)	(0.396)	(0.161)	(0.114)	(0.119)
2012/13 x FA	0.128	-0.15	-0.386	0.427	-0.309	-0.246	-0.333	-0.244	-0.033
	(0.355)	(0.424)	(0.535)	(0.399)	(0.316)	(0.342)	(0.53)	(0.412)	(0.418)
2013/14 x FA	0.032	-0.465	-0.379	0.482	1.249**	1.287**	0.99	0.495	1.038***
	(0.219)	(0.311)	(0.337)	(0.351)	(0.621)	(0.533)	(0.776)	(0.322)	(0.387)
2014/15 x FA	-0.342	-0.706**	-0.754**	0.299	0.28	0.392**	-0.87	0.191	0.377
	(0.345)	(0.307)	(0.322)	(0.322)	(0.2)	(0.188)	(0.969)	(0.216)	(0.23)
2015/16 x FA	-0.233	-4.264	-3.893	-0.136	1.375***	0.987***	-0.249	0.179	0.429*
	(0.562)	(5.339)	(5.724)	(0.789)	(0.305)	(0.251)	(0.404)	(0.143)	(0.235)
2016/17 x FA	0.138	0.056	-0.008	0.606*	0.203	0.529	0.05	0.187	0.423**
	(0.175)	(0.317)	(0.419)	(0.364)	(0.461)	(0.459)	(0.503)	(0.17)	(0.215)
Share of year worked †	0.420*	0.463*	0.476*	0.341	0.370*	0.314**	-0.289	0.109	0.205
	(0.228)	(0.277)	(0.27)	(0.268)	(0.19)	(0.144)	(0.391)	(0.119)	(0.135)
Proportion male †	-0.001	0.107	0.175	-0.027	0.092	0.263	-0.367	0.155	-0.066
	(0.309)	(0.306)	(0.362)	(0.296)	(0.265)	(0.19)	(0.409)	(0.223)	(0.215)
Workers' age †	-0.005	0.011	0.002	-0.011	0.001	-0.008	0.075***	-0.005	-0.004
	(0.012)	(0.018)	(0.017)	(0.017)	(0.016)	(0.014)	(0.027)	(0.012)	(0.015)

Rainfall	0	-0.001*	-0.001*	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0.001)	(0)	(0)
Constant	0.323	-0.282	-0.043	0.216	0.39	0.600*	-1.509**	0.216	0.253
	(0.448)	(0.668)	(0.707)	(0.566)	(0.337)	(0.337)	(0.746)	(0.28)	(0.372)
Ln (alpha)	-1.600***	-1.443***	-1.445***	-1.514***	-20.29	-20.098	-2.366***	-2.483***	-2.384***
	(0.229)	(0.159)	(0.165)	(0.466)	((.))	((.))	(0.463)	(0.2)	(0.228)
Pseudo R-squared	0.007	0.013	0.012	0.007	0.098	0.092	0.039	0.011	0.013
N	262	170	164	141	53	60	49	149	148

Note: the level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A negative binomial regression was used, and the results were weighted using pre-policy firm size (in terms of the number of jobs). The dependent variable in the successive columns is the number of jobs in farms that i) export to a specific region, ii) export their highest export amount to a specific region, and iii) export most frequently to a specific region. The exposure variable is the firm size in the prior year, and as such we model year-on-year employment growth as explained in Section 4.2. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level and shown in parentheses. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices. ***p<0.01, **p<0.05, *p<0.1. † indicates pre-policy values.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A12: Unweighted regressions – minimum wage effect on real monthly wages within farms that predominantly export fruit and vegetables

	Export:								
	to EU	highest amount to EU	most frequently to EU	to SADC	highest amount to SADC	most frequently to SADC	not to EU and SADC	highest amount not to EU and SADC	most frequently not to EU and SADC
Fraction affected (FA)	-0.553***	-0.821***	-0.700***	-0.509**	-0.581***	-0.644***	-0.472*	-0.535***	-0.423*
	(0.131)	(0.15)	(0.141)	(0.2)	(0.197)	(0.206)	(0.252)	(0.191)	(0.233)
2010/11	0.161	-0.176	-0.129	0.53	0.677	0.606	-0.231	0.004	0.07
	(0.167)	(0.379)	(0.237)	(0.417)	(0.694)	(0.659)	(0.205)	(0.168)	(0.195)
2012/13	0.107	0.184	0.199	0.079	0.091	0.237	0.089	-0.043	0.018
	(0.153)	(0.307)	(0.267)	(0.074)	(0.096)	(0.174)	(0.196)	(0.115)	(0.126)
2013/14	0.143	0.332	0.136	0.063	-0.324	-0.291	-0.248	-0.111	-0.079
	(0.17)	(0.512)	(0.291)	(0.097)	(0.228)	(0.227)	(0.203)	(0.12)	(0.12)
2014/15	-0.031	0.13	-0.433*	0.076	-0.727***	-0.807***	0.002	-0.045	0.075
	(0.124)	(0.365)	(0.233)	(0.083)	(0.194)	(0.199)	(0.135)	(0.101)	(0.124)
2015/16	0.349	-0.775***	-0.564**	0.06	0.366	0.42	0.15	0.453*	0.349
	(0.339)	(0.259)	(0.247)	(0.233)	(0.455)	(0.464)	(0.197)	(0.238)	(0.235)
2016/17	-0.239	-0.898***	-0.521**	-0.151	-1.587***	-1.715***	0.321	0.017	0.135
	(0.147)	(0.254)	(0.207)	(0.114)	(0.225)	(0.222)	(0.262)	(0.149)	(0.164)
2010/11 x FA	-0.279	0.219	0.111	-0.693	-0.928	-0.797	0.291	-0.18	-0.252
	(0.199)	(0.421)	(0.265)	(0.463)	(0.783)	(0.742)	(0.275)	(0.226)	(0.301)
2012/13 x FA	0.015	0.077	-0.108	-0.07	-0.157	-0.299	-0.057	0.047	0.054
	(0.219)	(0.343)	(0.304)	(0.222)	(0.155)	(0.222)	(0.249)	(0.226)	(0.263)
2013/14 x FA	0.227	0.201	0.33	0.039	0.477	0.419	0.912***	0.548*	0.560*
	(0.22)	(0.553)	(0.334)	(0.231)	(0.292)	(0.315)	(0.346)	(0.286)	(0.324)
2014/15 x FA	0.422**	0.441	0.970***	0.084	1.087***	1.200***	0.199	0.182	0.056
	(0.196)	(0.439)	(0.275)	(0.199)	(0.267)	(0.276)	(0.249)	(0.194)	(0.253)
2015/16 x FA	-0.022	1.201***	1.029***	0.278	0.053	-0.067	-0.006	-0.259	-0.211
	(0.382)	(0.302)	(0.335)	(0.322)	(0.551)	(0.565)	(0.298)	(0.322)	(0.315)
2016/17 x FA	0.657***	1.480***	1.027***	0.732***	2.340***	2.547***	-0.137	0.231	0.132
	(0.203)	(0.292)	(0.278)	(0.201)	(0.258)	(0.25)	(0.34)	(0.216)	(0.26)
Share of year worked †	-1.449***	-1.126***	-1.465***	-1.563***	-1.649***	-1.725***	-0.907***	-1.668***	-1.294***
	(0.162)	(0.193)	(0.205)	(0.176)	(0.169)	(0.165)	(0.295)	(0.172)	(0.158)

Proportion male †	-0.098	0.113	-0.016	-0.125	0.234*	0.289**	0.163	-0.291**	-0.217
	(0.187)	(0.242)	(0.271)	(0.107)	(0.132)	(0.123)	(0.283)	(0.147)	(0.135)
Workers' age †	0.004	-0.003	0.008	-0.008	-0.013	-0.012	-0.016	0.003	0.001
	(0.009)	(0.011)	(0.013)	(0.008)	(0.008)	(0.009)	(0.014)	(0.006)	(0.006)
Rainfall	-0.000***	-0.001***	-0.000**	-0.000**	0	0	0	0	-0.000**
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Constant	9.989***	10.153***	9.962***	10.461***	10.286***	10.256***	10.019***	10.252***	10.027***
	-0.297	-0.383	-0.393	-0.246	-0.285	-0.306	-0.3	-0.242	-0.241
Ln (alpha)	-1.615***	-1.649***	-1.666***	-2.037***	-2.364***	-2.364***	-2.156***	-1.916***	-1.786***
	(0.178)	(0.19)	(0.214)	(0.218)	(0.353)	(0.32)	(0.246)	(0.202)	(0.207)
Pseudo R-squared	0.040	0.039	0.045	0.057	0.073	0.073	0.034	0.048	0.034
N	323	210	206	212	100	111	85	212	205

Note: the level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A negative binomial regression was used, and the results were not weighted. The dependent variable in the successive columns is real monthly wages in farms that i) export to a specific region, ii) export their highest export amount to a specific region, and iii) export most frequently to a specific region. The exposure variable is the proportion of the year that workers worked. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices. ***p<0.01, **p<0.05, *p<0.1. † indicates pre-policy values.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A13: Weighted regressions – minimum wage effect on real monthly wages within farms that predominantly export fruit and vegetables

	Export:								
	to EU	highest amount to EU	most frequently to EU	to SADC	highest amount to SADC	most frequently to SADC	not to EU and SADC	highest amount not to EU and SADC	most frequently not to EU and SADC
Fraction affected (FA)	-1.001***	-1.014***	-1.162***	-1.496***	-1.780***	-1.876***	-0.633**	-0.969***	-0.802***
	(0.172)	(0.226)	(0.275)	(0.35)	(0.237)	(0.358)	(0.251)	(0.167)	(0.171)
2010/11	-0.135	-0.470**	0.048	-0.341	-0.404	-0.766**	-0.412**	-0.383**	-0.276
	(0.167)	(0.223)	(0.857)	(0.341)	(0.258)	(0.38)	(0.166)	(0.168)	(0.183)
2012/13	0.26	0.528	0.805**	-0.162	0.27	0.289	0.059	-0.055	0.059
	(0.321)	(0.383)	(0.41)	(0.342)	(0.28)	(0.381)	(0.157)	(0.149)	(0.169)
2013/14	-0.132	-0.346	-0.434	-0.494	-0.942***	-0.611	-0.222	-0.06	-0.044
	(0.169)	(0.524)	(0.273)	(0.356)	(0.248)	(0.484)	(0.221)	(0.176)	(0.173)
2014/15	-0.136	0.054	-0.576	-0.273	0.23	0.465	-0.046	-0.125	0.021
	(0.186)	(0.387)	(0.744)	(0.329)	(0.446)	(0.673)	(0.138)	(0.143)	(0.158)
2015/16	-0.124	-1.109***	-0.708	0.162	0.804	0.74	0.109	0.04	-0.029
	(0.427)	(0.392)	(1.958)	(0.649)	(0.568)	(0.593)	(0.17)	(0.142)	(0.111)
2016/17	-0.558*	-1.043***	-1.116***	-0.661**	-1.620**	-2.191***	0.519*	0.183	0.249
	(0.303)	(0.285)	(0.346)	(0.335)	(0.631)	(0.656)	(0.293)	(0.289)	(0.241)
2010/11 x FA	0.129	0.508*	-0.081	0.479	0.453	0.916**	0.392	0.404*	0.368
	(0.231)	(0.279)	(0.941)	(0.421)	(0.304)	(0.461)	(0.253)	(0.208)	(0.234)
2012/13 x FA	-0.3	-0.549	-0.918**	0.163	-0.396	-0.444	-0.005	0.11	0.091
	(0.364)	(0.408)	(0.428)	(0.36)	(0.312)	(0.418)	(0.252)	(0.181)	(0.222)
2013/14 x FA	0.399*	0.685	0.751**	0.890**	1.381***	0.876	0.472	0.313	0.362*
	(0.214)	(0.551)	(0.329)	(0.443)	(0.292)	(0.637)	(0.3)	(0.207)	(0.207)
2014/15 x FA	0.528**	0.404	1.01	0.509	-0.002	-0.254	0.241	0.433**	0.315
	(0.22)	(0.432)	(0.805)	(0.335)	(0.482)	(0.721)	(0.261)	(0.189)	(0.213)
2015/16 x FA	0.427	1.358***	1.055	0.218	-0.184	-0.148	0.13	0.446	0.307*
	(0.509)	(0.483)	(2.234)	(0.763)	(0.641)	(0.663)	(0.305)	(0.291)	(0.166)
2016/17 x FA	1.012***	1.566***	1.650***	1.520***	2.585***	3.204***	-0.227	0.159	0.109
	(0.342)	(0.345)	(0.422)	(0.421)	(0.787)	(0.776)	(0.41)	(0.335)	(0.294)
% of year worked †	-1.700***	-1.456***	-1.814***	-1.653***	-2.552***	-2.222***	-1.634***	-1.999***	-1.561***
	(0.129)	(0.169)	(0.2)	(0.267)	(0.218)	(0.223)	(0.241)	(0.157)	(0.116)

Proportion male †	-0.276	-0.24	-0.306	0.008	0.761***	0.971***	0.131	0.132	-0.05
	(0.182)	(0.207)	(0.265)	(0.324)	(0.169)	(0.279)	(0.213)	(0.172)	(0.17)
Workers' age †	-0.006	-0.008	0.01	-0.028	-0.01	-0.015	-0.021	-0.007	-0.025***
	(0.012)	(0.016)	(0.018)	(0.022)	(0.015)	(0.019)	(0.017)	(0.013)	(0.009)
Rainfall	0	0	0	0	0.001**	0.001**	-0.000**	-0.000*	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Constant	10.698***	10.661***	10.489***	11.609***	10.922***	10.833***	10.948***	10.828***	11.000***
	-0.309	-0.539	-0.615	-0.592	-0.406	-0.548	-0.439	-0.327	-0.194
Ln (alpha)	-2.163***	-2.159***	-2.295***	-2.741***	-3.752***	-3.386***	-3.293***	-2.709***	-2.306***
	(0.35)	(0.399)	(0.363)	(0.191)	(0.388)	(0.394)	(0.209)	(0.277)	(0.492)
Pseudo R-squared	0.058	0.050	0.061	0.088	0.137	0.119	0.096	0.092	0.062
N	323	210	206	212	100	111	85	212	205

Note: the level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A negative binomial regression was used, and the results were weighted using pre-policy firm size (in terms of the number of jobs). The dependent variable in the successive columns is real monthly wages in farms that i) export to a specific region, ii) export their highest export amount to a specific region, and iii) export most frequently to a specific region. The exposure variable is the proportion of the year that workers worked. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices. ***p<0.01, **p<0.05, *p<0.1. † indicates pre-policy values.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A14: Unweighted regressions – minimum wage effect on fraction of year worked within farms that predominantly export fruit and vegetables

	Export:								
	to EU	highest amount to EU	most frequently to EU	to SADC	highest amount to SADC	most frequently to SADC	not to EU and SADC	highest amount not to EU and SADC	most frequently not to EU and SADC
Fraction affected (FA)	-1.761**	0.022	-0.038	-2.423**	-0.93	-1.035	-3.651	-3.251***	-3.953***
	(0.836)	(0.513)	(0.504)	(0.952)	(1.559)	(1.449)	(2.459)	(1.174)	(1.173)
2010/11	-0.769	1.468	-0.876*	-1.684*	-1.243	-1.418	-0.769	-1.528	-0.987
	(0.917)	(1.793)	(0.499)	(0.991)	(1.046)	(1.011)	(3.41)	(1.628)	(1.737)
2012/13	-0.282	1.002	0.079	-0.518	0.161	0.314	-2.429	-1.568	-1.516
	(0.397)	(0.838)	(0.423)	(0.713)	(1.129)	(1.307)	(4.335)	(1.451)	(1.344)
2013/14	-1.248	-0.225	-0.194	-0.541	0.083	-0.058	-5.019**	-2.100*	-2.041
	(0.835)	(0.567)	(0.466)	(1.464)	(1.44)	(1.41)	(2.156)	(1.174)	(1.414)
2014/15	0.298	-2.525*	3.881**	0.129	-1.076	-1.16	-1.39	-0.094	-1.029
	(0.776)	(1.4)	(1.518)	(1.099)	(2.133)	(2.09)	(1.974)	(0.905)	(1.096)
2015/16	-1.474	2.606	4.689***	0.277	-1.838	-1.781	-1.182	-2.097	-2.387
	(1.878)	(2.003)	(1.013)	(1.374)	(1.897)	(1.855)	(3.879)	(2.05)	(1.86)
2016/17	-2.003	0.742	-0.334	-2.038	3.318**	3.161**	-3.888*	-3.774***	-3.897***
	(1.311)	(1.428)	(0.732)	(1.473)	(1.391)	(1.35)	(1.947)	(1.082)	(1.041)
2010/11 x FA	1.362	-0.798	1.246**	1.777	0.534	1.251	1.199	1.843	1.399
	(1)	(1.923)	(0.576)	(1.206)	(1.437)	(1.419)	(3.882)	(1.83)	(1.908)
2012/13 x FA	-0.175	-1.73	-0.762	0.469	-0.732	-0.785	2.74	1.922	1.834
	(0.588)	(1.045)	(0.728)	(0.929)	(1.544)	(1.592)	(4.714)	(1.608)	(1.498)
2013/14 x FA	1.053	-0.25	-0.531	1.142	0.252	0.579	4.902*	2.261	2.348
	(1.037)	(1.047)	(0.892)	(1.751)	(1.981)	(1.831)	(2.534)	(1.405)	(1.647)
2014/15 x FA	-0.253	2.4	-4.664***	0.249	1.237	1.414	1.975	0.577	2.031
	(0.867)	(1.472)	(1.442)	(1.335)	(2.67)	(2.587)	(2.141)	(1.074)	(1.254)
2015/16 x FA	2.039	-1.987	-4.577***	-0.596	1.549	1.573	2.314	2.507	3.304
	(2.028)	(2.122)	(1.182)	(1.585)	(2.391)	(2.314)	(4.285)	(2.211)	(2.077)
2016/17 x FA	2.163	-0.768	0.054	1.092	-5.731***	-5.504***	3.56	3.961***	4.485***
	(1.491)	(1.313)	(0.916)	(1.744)	(2.091)	(2.02)	(2.298)	(1.245)	(1.387)
% of year worked †	4.055***	3.177***	4.423***	5.582***	6.772***	6.765***	5.675***	5.315***	3.809***
	(0.837)	(1.126)	(0.986)	(0.819)	(1.148)	(1.104)	(1.408)	(0.582)	(1.015)

Proportion male †	0.184	-0.204	0.093	0.704	0.519	0.58	1.948*	0.349	0.03
	(0.933)	(1.09)	(0.706)	(0.8)	(1.022)	(0.989)	(1.093)	(0.524)	(0.689)
Workers' age †	0.087*	0.092	0.056	0.076*	0.078	0.081	-0.029	0.035	0.039
	(0.044)	(0.069)	(0.061)	(0.045)	(0.072)	(0.072)	(0.074)	(0.032)	(0.037)
Rainfall	0.001	0.001	0.002**	0.001	-0.001	0	0.003*	0.001	0
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-3.766**	-5.236**	-4.793**	-3.706**	-4.508**	-4.780**	-1.256	-1.33	0.027
	(1.602)	(2.403)	(2.324)	(1.611)	(2.059)	(2.078)	(1.52)	(1.552)	(1.849)
R-squared	0.413	0.329	0.482	0.623	0.625	0.626	0.480	0.532	0.396
N	312	203	196	208	98	109	85	208	204

Note: the level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A group logit regression was used, and the results were not weighted. The dependent variable in the successive columns is the transformed fraction of year worked (log(mean_fraction_worked/(1- mean_fraction_worked))) in farms that i) export to a specific region, ii) export their highest export amount to a specific region, and iii) export most frequently to a specific region. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered on the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A15: Weighted regressions – minimum wage effect on fraction of year worked within farms that predominantly export fruit and vegetables

	Export:								
	to EU	highest amount to EU	most frequently to EU	to SADC	highest amount to SADC	most frequently to SADC	not to EU and SADC	highest amount not to EU and SADC	most frequently not to EU and SADC
Fraction affected (FA)	-0.035	-0.194	0.29	1.051	-0.47	-0.321	-2.839	-1.226	-1.697
	(0.569)	(0.663)	(0.571)	(0.901)	(0.529)	(0.769)	(2.667)	(1.863)	(1.928)
2010/11	1.409	5.381*	-0.212	0.977	-0.018	-2.059	2.115	1.54	1.636
	(1.909)	(3.051)	(1.532)	(1.102)	(0.651)	(1.757)	(3.743)	(2.81)	(2.858)
2012/13	-0.684	-1.151	-1.061	1.163	-0.564	-0.672	3.054	1.595	0.362
	(0.537)	(0.756)	(0.761)	(1.051)	(0.564)	(0.742)	(2.938)	(2.71)	(2.612)
2013/14	-0.193	-0.517	0.354	2.637	0.648	0.394	-4.331*	-0.414	-0.254
	(0.362)	(0.661)	(0.32)	(1.596)	(1.097)	(1.246)	(2.264)	(1.499)	(1.702)
2014/15	-0.174	-2.948	-1.436	2.141	-2.393*	-2.614*	-0.75	0.436	-0.078
	(0.675)	(1.777)	(2.118)	(1.698)	(1.408)	(1.553)	(1.758)	(1.616)	(1.629)
2015/16	-0.25	-0.043	-4.041	2.512	-2.598	-3.757	3.768	1.519	0.714
	(0.718)	(1.34)	(3.564)	(2.846)	(1.894)	(2.449)	(2.656)	(2.442)	(2.462)
2016/17	0.257	0.012	-0.497	1.802**	2.768*	2.93	-3.880*	-2.162	-2.572
	(0.546)	(1.293)	(0.75)	(0.871)	(1.531)	(2.24)	(2.247)	(1.729)	(1.674)
2010/11 x FA	-0.905	-4.896	0.637	-0.371	0.173	3.2	-1.077	-1.457	-1.628
	(2.137)	(3.36)	(1.863)	(1.304)	(0.721)	(2.335)	(4.401)	(3.2)	(3.269)
2012/13 x FA	1.01	1.510*	1.413	-0.742	1.037	1.16	-3.527	-1.645	-0.11
	(0.646)	(0.903)	(0.891)	(1.11)	(0.633)	(0.852)	(3.297)	(3.046)	(2.952)
2013/14 x FA	0.333	0.645	-0.336	-2.223	-0.167	0.492	4.38	0.541	0.491
	(0.522)	(0.811)	(0.541)	(1.762)	(1.188)	(1.445)	(2.824)	(1.785)	(2.048)
2014/15 x FA	0.07	2.833	1.24	-1.795	3.202**	3.385*	3.02	0.027	0.723
	(0.741)	(1.863)	(2.248)	(1.848)	(1.511)	(1.694)	(2.204)	(1.759)	(1.774)
2015/16 x FA	0.686	0.497	4.371	-2.308	2.805	4.044	-2.652	-1.111	0.507
	(0.771)	(1.258)	(3.898)	(3.068)	(2.151)	(2.775)	(3.055)	(2.681)	(2.857)
2016/17 x FA	-0.059	0.155	0.198	-2.466**	-3.452*	-3.342	3.594	2.647	3.822
	(0.868)	(1.231)	(0.952)	(0.998)	(1.84)	(2.728)	(3.242)	(2.013)	(2.302)
% of year worked †	4.158***	3.629**	4.505***	5.321***	5.270***	6.809***	7.055***	5.576***	4.344***
	(1.031)	(1.521)	(1.184)	(1.066)	(0.531)	(1.222)	(1.318)	(0.499)	(1.235)

Proportion male †	0.138	0.322	1.013*	1.705*	0.544	0.984	3.345**	0.119	0.202
	(0.665)	(1.131)	(0.588)	(0.905)	(0.696)	(0.922)	(1.64)	(0.544)	(0.653)
Workers' age †	0.102	0.18	0.074	0.095	0.078**	0.157*	-0.153	-0.080*	-0.002
	(0.079)	(0.125)	(0.084)	(0.113)	(0.037)	(0.082)	(0.112)	(0.042)	(0.096)
Rainfall	0	0	0	0	-0.001**	-0.002	0.005**	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.002)
Constant	-5.336**	-7.297*	-5.346*	-7.344**	-4.093***	-7.465***	-1.194	0.116	-0.527
	(2.405)	(3.773)	(2.814)	(3.517)	(0.943)	(2.65)	(2.868)	(2.028)	(2.411)
R-squared	0.449	0.433	0.587	0.683	0.782	0.782	0.690	0.619	0.428
N	312	203	196	208	98	109	85	208	204

Note: the level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A group logit regression was used, and the results were weighted using pre-policy firm size (in terms of the number of jobs). The dependent variable in the successive columns is the transformed fraction of year worked (log(mean_fraction_worked/(1- mean_fraction_worked))) in farms that i) export to a specific region, ii) export their highest export amount to a specific region, and iii) export most frequently to a specific region. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZA6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A16: Unweighted and weighted regression results – minimum wage effect on farmers' export destinations among those that export to the UK

	Export:					
	to UK	highest amount to UK	most frequently to UK	to UK	highest amount to UK	most frequently to UK
	Unweighted			Weighted		
Fraction affected (FA)	1.274	-0.159	0.614	2.267	-0.078	-3.958*
	(1.156)	(1.365)	(1.215)	(2.197)	(2.617)	(2.054)
2012/13	1.808	1.117	-0.616	5.213	3.05	-3.742
	(1.764)	(2.323)	(1.399)	(4.769)	(6.112)	(2.829)
2013/14	-1.319	-0.602	1.099	-0.118	1.091	-2.993
	(1.24)	(1.467)	(2.511)	(2.526)	(2.882)	(10.313)
2014/15	1.033	0.217	0.623	0.228	1.598	1.438
	(0.963)	(1.327)	(1.483)	(2.3)	(2.852)	(2.076)
2015/16	1.519	-1.018	-0.127	2.964	-1.331	-4.366***
	(1.066)	(0.757)	(1.223)	(2.255)	(1.516)	(1.637)
2016/17	-0.124	1.731	0.506	1.888	4.943	-2.103
	(1.429)	(2.094)	(0.881)	(2.207)	(4.214)	(1.651)
2012/13 x FA	-2.795	-2.855	0.668	-9.006	-5.417	4.886
	(2.122)	(2.387)	(1.734)	(5.621)	(6.495)	(2.971)
2013/14 x FA	1.073	0.685	-2.482	-1.13	-1.741	2.672
	(1.517)	(1.645)	(2.882)	(2.622)	(2.802)	(11.136)
2014/15 x FA	-1.987	-0.626	-1.439	1.512	-3.013	-2.719
	(1.348)	(1.732)	(1.86)	(2.85)	(3.512)	(2.762)
2015/16 x FA	-2.235	1.242	-0.8	-3.545	1.73	4.462**
	(1.445)	(1.373)	(1.556)	(2.397)	(1.891)	(1.843)
2016/17 x FA	0.795	-2.224	-0.757	-1.54	-6.533	2.355
	(1.677)	(2.351)	(1.24)	(2.238)	(4.544)	(1.837)
Share of year worked †	-0.807	0.77	-0.78	-0.069	0.317	0.27
	(0.555)	(0.926)	(0.871)	(0.758)	(1.185)	(1.024)
Proportion male †	-0.607	1.134	-0.634	-1.73	-2.092	-3.684**
	(0.694)	(0.928)	(0.872)	(1.385)	(1.727)	(1.602)
Workers' age †	0.038	-0.064	-0.002	-0.056	-0.256**	-0.238**
	(0.032)	(0.048)	(0.05)	(0.087)	(0.121)	(0.118)

Rainfall	0	0.001	-0.001	0.001	0.003	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Lagged dep. var.	4.979***	5.666***	4.623***	5.805***	5.533***	5.374***
	(0.523)	(0.671)	(0.567)	(0.978)	(0.892)	(0.84)
Constant	-3.931**	-2.538	-2.025	-2.542	3.946	7.666*
	(1.547)	(1.728)	(1.612)	(3.562)	(4.384)	(4.031)
Pseudo R-squared	0.594	0.63	0.525	0.638	0.694	0.672
N	372	372	372	372	372	372

Note: the level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A logit regression was used. The results on the left were not weighted while the results on the right were weighted by firm size (in terms of the number of jobs). Standard errors were clustered at the firm level and are shown in parentheses. The dependent variables in the successive columns are binary variables to indicate whether a farm i) exports to the UK, ii) exports its highest export amount to the UK, and iii) exports most frequently to the UK. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the average workers' age. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices. ***p<0.01, **p<0.05, *p<0.1. † indicates pre-policy values.

Source: own calculations using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A17: Unweighted and weighted regressions – minimum wage effect on employment growth within farms that export to the UK

	Export:					
	to UK	highest amount to UK	most frequently to UK	to UK	highest amount to UK	most frequently to UK
	Unweighted			Weighted		
Fraction affected (FA)	0.126	-0.166	-0.153	-0.026	-0.107	-0.114
	(0.255)	(0.176)	(0.197)	(0.173)	(0.223)	(0.254)
2012/13	0.152	0.09	-0.307**	0.085	0.127	-0.351***
	(0.256)	(0.309)	(0.125)	(0.314)	(0.332)	(0.089)
2013/14	-0.227	-0.23	-0.194	-0.412***	-0.346**	-0.419***
	(0.177)	(0.15)	(0.223)	(0.139)	(0.168)	(0.15)
2014/15	0.117	0.088	0.104	0.103	-0.044	-0.02
	(0.166)	(0.168)	(0.172)	(0.141)	(0.117)	(0.117)
2015/16	0.415	-0.289**	-0.313***	-0.043	-0.262***	-0.321***
	(0.682)	(0.117)	(0.117)	(0.23)	(0.073)	(0.074)
2016/17	-0.152	-0.235**	-0.274***	-0.159**	-0.214**	-0.258***
	(0.117)	(0.103)	(0.102)	(0.077)	(0.098)	(0.09)
2012/13 x FA	-0.262	0.003	0.430**	-0.113	-0.266	0.349
	(0.378)	(0.368)	(0.21)	(0.417)	(0.44)	(0.245)
2013/14 x FA	0.177	0.356	0.385	0.479**	0.572	0.753*
	(0.323)	(0.307)	(0.415)	(0.227)	(0.423)	(0.446)
2014/15 x FA	-0.301	-0.062	-0.253	-0.079	0.591***	0.401
	(0.318)	(0.418)	(0.412)	(0.273)	(0.226)	(0.279)
2015/16 x FA	-0.542	0.375*	0.377	-0.281	0.350*	0.406*
	(0.81)	(0.219)	(0.241)	(0.623)	(0.19)	(0.226)
2016/17 x FA	0.074	0.329*	0.366*	0.205	0.372**	0.423**
	(0.263)	(0.199)	(0.214)	(0.149)	(0.174)	(0.193)
Share of year worked †	0.11	0.151	0.064	0.214	0.254*	0.155
	(0.134)	(0.117)	(0.117)	(0.144)	(0.131)	(0.122)
Proportion male †	-0.172	-0.088	-0.14	-0.278	-0.06	-0.029
	(0.222)	(0.157)	(0.127)	(0.389)	(0.218)	(0.241)
Workers' age †	0.007	-0.007	-0.005	-0.007	0.002	0.004
	(0.012)	(0.008)	(0.007)	(0.011)	(0.019)	(0.02)

Rainfall	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)
Constant	-0.272	0.356	0.431*	0.167	0.005	0.166
	(0.382)	(0.268)	(0.222)	(0.309)	(0.469)	(0.525)
Ln(alpha)	-1.832***	-2.110***	-2.231***	-1.581***	-2.415***	-2.460***
	(0.289)	(0.347)	(0.372)	(0.282)	(0.41)	(0.384)
Pseudo R-squared	0.005	0.006	0.008	0.006	0.02	0.016
N	183	72	76	183	72	76

Note: the level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A negative binomial regression was used. The results on the left were not weighted while the results on the right were weighted by firm size (in terms of the number of jobs). The dependent variable in the successive columns is the number of jobs in farms that i) export to the UK, ii) export their highest export amount to the UK, and iii) export most frequently to the UK. The exposure variable is the firm size in the prior year, and as such we model year-on-year employment growth as explained in Section 4.2. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level and shown in parentheses. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices. ***p<0.01, **p<0.05, *p<0.1. † indicates pre-policy values.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A18: Unweighted and weighted regressions – minimum wage effect on real monthly wages among farmers who export to the UK

	Export:					
	to UK	highest amount to UK	most frequently to UK	to UK	highest amount to UK	most frequently to UK
	Unweighted			Weighted		
Fraction affected (FA)	-0.621***	-0.838***	-0.576*	-1.059***	-0.872***	-0.841***
	(0.2)	(0.21)	(0.296)	(0.227)	(0.23)	(0.205)
2011/12	0.007	-0.286	-0.159	-0.413**	-0.412**	-0.293
	(0.199)	(0.178)	(0.184)	(0.192)	(0.198)	(0.242)
2012/13	-0.235	-0.215	0.011	-0.238	-0.072	0.094
	(0.169)	(0.207)	(0.23)	(0.245)	(0.208)	(0.233)
2013/14	-0.042	-0.111	-0.001	-0.11	0.017	-0.014
	(0.137)	(0.199)	(0.187)	(0.214)	(0.223)	(0.207)
2014/15	0.006	-0.117	0.009	-0.121	-0.14	0.002
	(0.096)	(0.172)	(0.158)	(0.172)	(0.191)	(0.178)
2015/16	0.386	0.03	0.176	0.114	0.03	0.223
	(0.236)	(0.195)	(0.176)	(0.187)	(0.208)	(0.141)
2016/17	0.206	0.111	0.015	0.195	0.163	-0.002
	(0.205)	(0.276)	(0.156)	(0.311)	(0.326)	(0.153)
2011/12 x FA	-0.078	0.335	-0.058	0.516**	0.514**	0.355
	(0.245)	(0.208)	(0.311)	(0.224)	(0.249)	(0.292)
2012/13 x FA	0.351	0.299	-0.129	0.277	0.128	-0.041
	(0.26)	(0.252)	(0.392)	(0.299)	(0.253)	(0.275)
2013/14 x FA	0.353	0.328	0.043	0.366	0.226	0.267
	(0.229)	(0.247)	(0.372)	(0.258)	(0.264)	(0.25)
2014/15 x FA	0.249	0.395	0.155	0.494**	0.452*	0.353
	(0.177)	(0.248)	(0.318)	(0.197)	(0.24)	(0.225)
2015/16 x FA	-0.083	0.36	-0.256	0.144	0.459	-0.092
	(0.303)	(0.318)	(0.349)	(0.311)	(0.374)	(0.214)
2016/17 x FA	0.091	0.103	0.043	0.156	0.032	0.264
	(0.271)	(0.354)	(0.343)	(0.357)	(0.373)	(0.229)
Share of year worked †	-1.779***	-1.935***	-1.697***	-1.910***	-1.909***	-1.669***
	(0.159)	(0.149)	(0.119)	(0.145)	(0.151)	(0.119)

Proportion male †	-0.147	-0.233	-0.223*	-0.226	0.037	-0.151
	(0.163)	(0.152)	(0.118)	(0.196)	(0.167)	(0.151)
Workers' age †	0.014*	0.009	0.004	0.005	0.011	-0.021*
	(0.007)	(0.007)	(0.005)	(0.012)	(0.015)	(0.011)
Rainfall	0	-0.000**	0	0	-0.001***	0
	(0)	(0)	(0)	(0)	(0)	(0)
Constant	9.837***	10.439***	10.203***	10.448***	10.423***	10.934***
	(0.297)	(0.249)	(0.248)	(0.256)	(0.307)	(0.255)
Ln(alpha)	-1.827***	-2.617***	-1.953***	-2.368***	-2.893***	-2.270***
	(0.215)	(0.218)	(0.395)	(0.412)	(0.387)	(0.698)
Pseudo R-squared	0.053	0.096	0.059	0.068	0.102	0.065
N	226	94	98	226	94	98

Note: the level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A negative binomial regression was used. The results on the left were not weighted while the results on the right were weighted by firm size (in terms of the number of jobs). The dependent variable in the successive columns is real monthly wages in farms that i) export to the UK, ii) export their highest export amount to the UK, and iii) export most frequently to the UK. The exposure variable is the proportion of the year that workers worked. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices. ***p<0.01, **p<0.05, *p<0.1. † indicates pre-policy values.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Table A19: Unweighted and weighted regressions – minimum wage effect on fraction of year worked among farmers who export to the UK

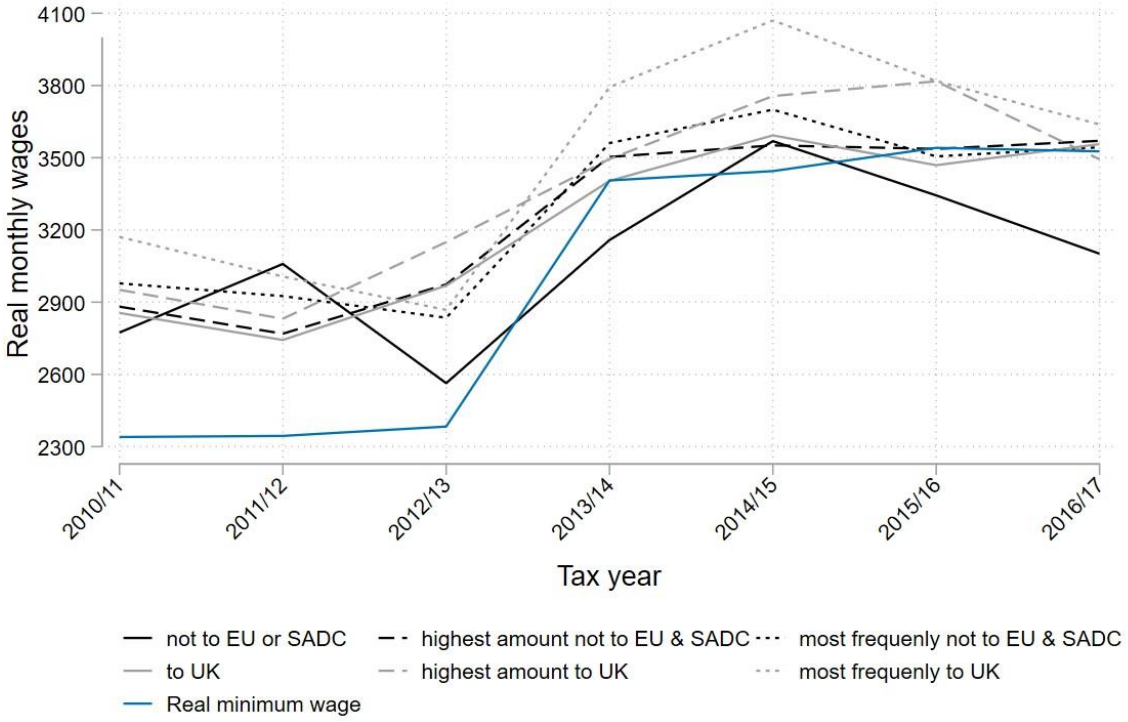
	Export:					
	to UK	highest amount to UK	most frequently to UK	to UK	highest amount to UK	most frequently to UK
	Unweighted			Weighted		
Fraction affected (FA)	-2.774**	-2.774	-4.188*	-1.326	-1.545	-2.759
	(1.287)	(2.175)	(2.144)	(2.019)	(2.533)	(2.541)
2011/12	-1.163	-0.223	-1.143	0.99	1.357	-0.527
	(1.842)	(3.118)	(3.012)	(3.185)	(3.604)	(4.098)
2012/13	-0.286	-0.475	-4.032*	0.701	1.779	-3.006
	(1.143)	(2.415)	(2.132)	(2.635)	(3.206)	(2.725)
2013/14	-1.047	-0.59	0.281	-1.06	-0.68	-0.244
	(1.468)	(2.002)	(1.916)	(1.841)	(2.186)	(2.431)
2014/15	-0.271	-0.697	-1.459	-1.112	-0.855	-1.699
	(0.88)	(1.536)	(1.659)	(1.607)	(1.953)	(1.954)
2015/16	-0.744	0.188	-0.063	1.299	-1.206	-1.285
	(2.001)	(1.749)	(1.661)	(2.056)	(1.833)	(1.623)
2016/17	-4.002***	-3.226	-3.361**	-2.945	-2.833	-2.85
	(1.284)	(1.949)	(1.605)	(2.077)	(2.576)	(2.029)
2011/12 x FA	1.928	0.671	1.911	-0.747	-1.423	0.564
	(2.068)	(3.576)	(3.439)	(3.499)	(4.163)	(4.686)
2012/13 x FA	0	0.506	4.717*	-0.578	-1.909	3.632
	(1.393)	(2.652)	(2.443)	(2.918)	(3.694)	(3.129)
2013/14 x FA	1.123	0.669	0.192	1.121	0.849	0.582
	(1.744)	(2.263)	(2.275)	(2.073)	(2.684)	(2.879)
2014/15 x FA	0.753	1.216	2.2	1.079	1.291	2.212
	(0.985)	(1.744)	(1.95)	(1.745)	(2.266)	(2.219)
2015/16 x FA	1.63	0.507	2.198	-0.957	1.787	3.136
	(2.218)	(1.979)	(2.218)	(2.226)	(2.107)	(2.192)
2016/17 x FA	4.777***	3.476	5.013**	3.359	3.544	4.788
	(1.515)	(2.243)	(2.378)	(2.352)	(2.937)	(2.884)
Share of year worked †	5.457***	5.580***	2.974**	5.231***	5.919***	3.240**
	(0.946)	(0.631)	(1.366)	(0.969)	(0.601)	(1.377)

Proportion male †	-0.481	-0.137	-1.213	-0.819	-1.229	-0.735
	(0.74)	(0.676)	(0.8)	(1.079)	(1.172)	(0.771)
Workers' age †	0.066*	0.027	0.117***	0.102	-0.093	0.125
	(0.038)	(0.042)	(0.042)	(0.096)	(0.068)	(0.148)
Rainfall	0	0.002	0	-0.001	0	-0.002
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Constant	-2.276	-2.095	-1.659	-3.777	1.396	-2.246
	(1.873)	(1.79)	(1.749)	(3.04)	(2.381)	(3.163)
Pseudo R-squared	0.539	0.603	0.485	0.538	0.643	0.372
N	219	94	97	219	94	97

Note: the level of analysis is at the firm level and was constructed by aggregating the IRP5 data to the firm level. 'FA' indicates the fraction affected and is a firm-level treatment intensity variable, as discussed in Section 4.2. A group logit regression was used. The results on the left were not weighted while the results on the right were weighted by firm size (in terms of the number of jobs). The dependent variable in the successive columns is the transformed fraction of year worked (log(mean_fraction_worked/(1-mean_fraction_worked))) in farms that i) export to the UK, ii) export their highest export amount to the UK, and iii) export most frequently to the UK. The base year is 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

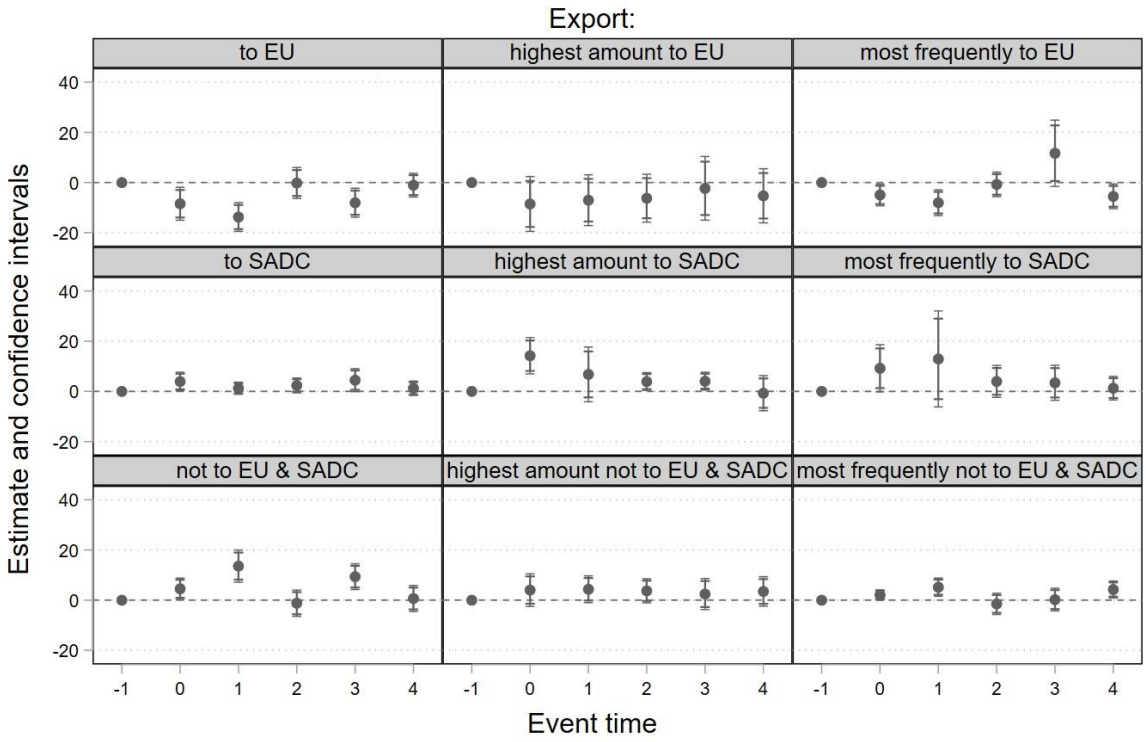
Figure A1: Monthly real agricultural wages by export region



Note: the EU group excludes the UK, as discussed in Section 3.2. The sample includes farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and that export without the use of an intermediary. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Figure A2: Minimum wage effect on farmers' export destinations that predominantly export fruit and vegetables – weighted results

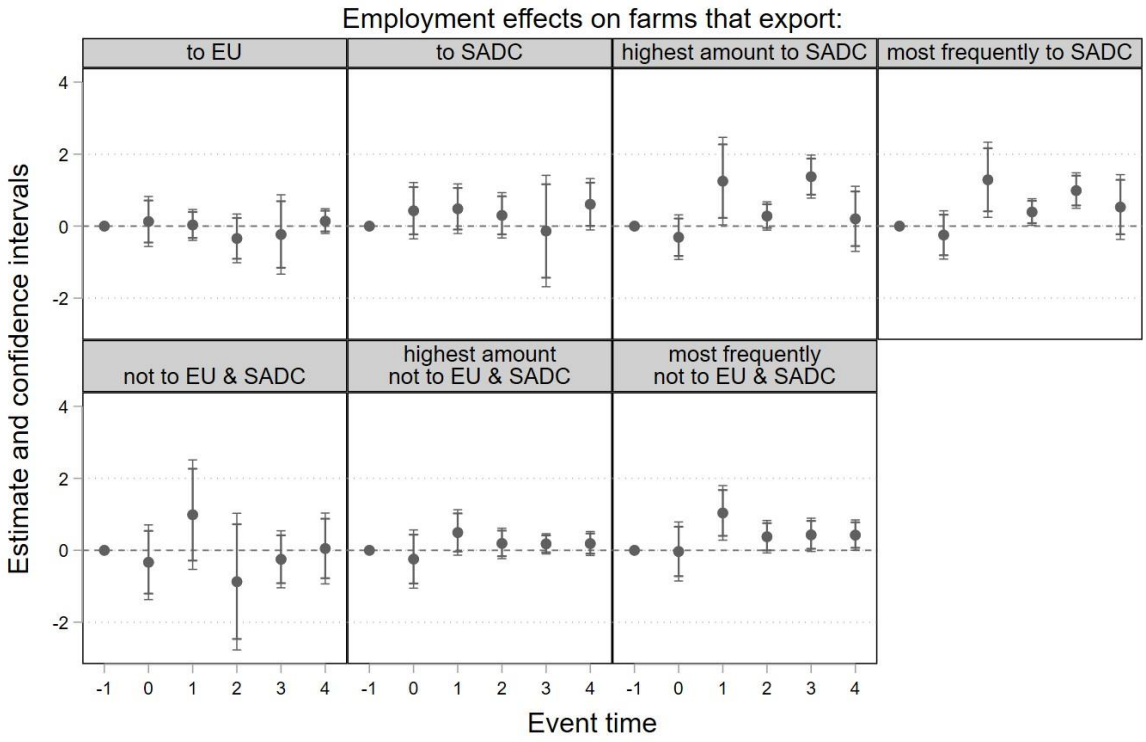


Note: this figure is the weighted version of Figure 4 in the main text. The figure plots the difference-in-difference coefficients (δ_t) from Equation (2) using a logit regression and are not weighted. The full regression results are shown in **Error! Reference source not found.** in the Appendix. The results are weighted using pre-policy firm size (in terms of the number of jobs). The 90% and 95% confidence intervals were plotted. The dependent variables in the successive columns are binary variables to indicate whether a farm i) exports to a specific region, ii) exports its highest export amount to a specific region, and iii) exports most frequently to a specific region. The EU group excludes the UK, as discussed in Section 3.2. Event time *t* = -1 indicates the base year, 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

While the unweighted results are our preferred results, we report and discuss the weighted results here. Since we already have a very selective and small sample that consists of large farms (Hanief 2018), the weighted results are sensitive as seen by very large coefficients and confidence intervals. The weighted results place the most weight on the largest farms in our sample. We thus do not over-interpret their findings, but we compare the unweighted and weighted results to assess whether most of the changes came from smaller or larger farms. By comparing the coefficients in Figure A2 to the unweighted coefficients in Figure 4, it becomes clear that most of the trade diversion was done by larger farms.

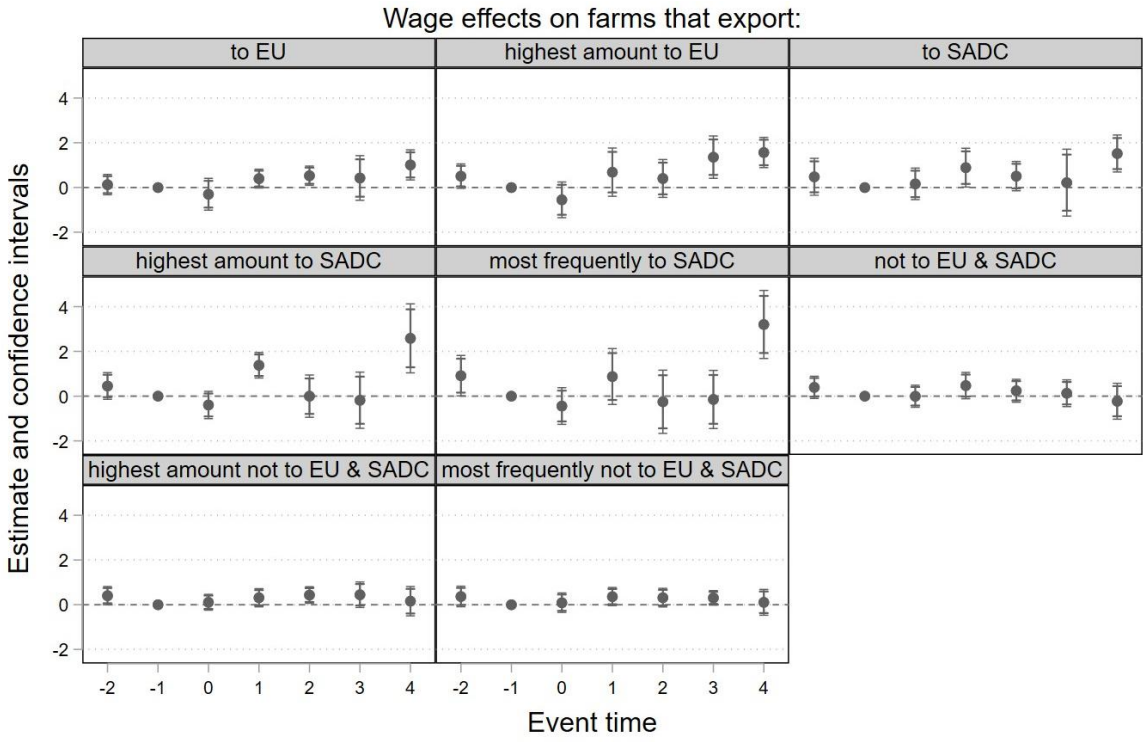
Figure A3: Minimum wage effect on employment growth among farmers who predominantly export fruit and vegetables – weighted results



Note: this figure is the weighted version of Figure 5 in the main text. The figure plots the difference-in-difference coefficients (δ_t) from Equation (3) using a negative binomial regression, and the results were weighted using pre-policy firm size (in terms of the number of jobs). The 90% and 95% confidence intervals were plotted. The dependent variable in the successive columns is the number of jobs in farms that i) export to a specific region, ii) export their highest export amount to a specific region, and iii) export most frequently to a specific region. Not all the regression results are shown since some of the coefficients are very large and made the figure unreadable. See Table A11 for the weighted regression tables. The EU group excludes the UK, as discussed in Section 3.2. Event time *t* = -1 indicates the base year, 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) and existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Figure A4: Minimum wage effect on real monthly wages on farms that predominantly export fruit and vegetables – weighted results

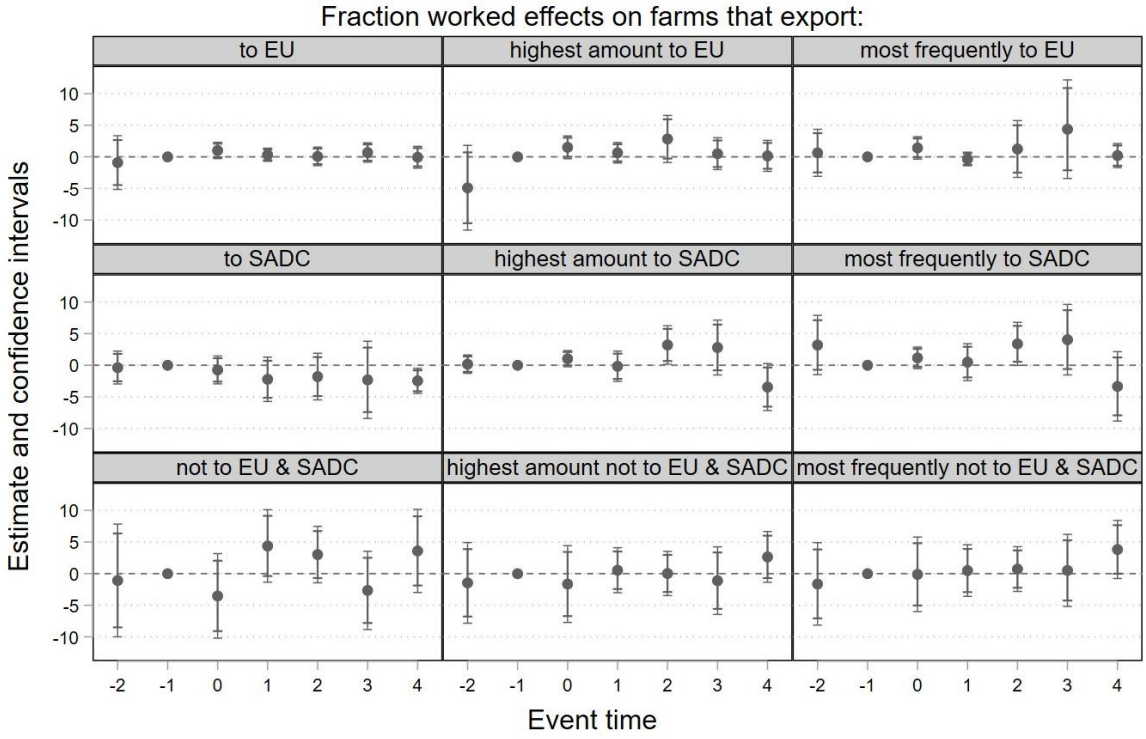


Note: this figure is the weighted version of Figure 6 in the main text. The figure plots the difference-in-difference coefficients (δ_t) from Equation (3) using a negative binomial regression. The results were weighted using pre-policy firm size (in terms of the number of jobs). The full regression results are shown in Table A13 in the Appendix. The 90% and 95% confidence intervals were plotted. The dependent variable in the successive columns is real monthly wages in farms that i) export to a specific region, ii) export their highest export amount to a specific region, and iii) export most frequently to a specific region. Not all the regression results are shown since some of the coefficients are very large and made the figure unreadable. See Table A13 for the weighted regression tables. The EU group excludes the UK, as discussed in Section 3.2. The exposure variable is the proportion of the year that workers worked. Event time *t* = -1 indicates the base year, 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Looking at the results that are weighted by pre-policy firm size (see Table A11 and Figure A4 in the Appendix), we observe that most employment growth rate adjustments came from larger farms (this holds for adjustments in the positive and negative direction). Table A13 and Figure A5 show the weighted wage regressions. Common trends do not hold as often as the unweighted sample, but where common trends do hold, the large farms were driving most of the wage results.

Figure A5: Minimum wage effect on fraction of year worked within farms that predominantly export fruit and vegetables – weighted results



Note: this figure is the weighted version of Figure 7 in the main text. The figure plots the difference-in-difference coefficients, (δ_t), from Equation (2) using a group logit regression. The results were weighted using pre-policy firm size (in terms of the number of jobs). The full regression results are shown in Table A15 in the Appendix. The 90% and 95% confidence intervals were plotted. The dependent variable in the successive columns is the transformed fraction of year worked (log(mean_fraction_worked/(1- mean_fraction_worked))) in farms that i) export to a specific region, ii) export their highest export amount to a specific region, and iii) export most frequently to a specific region. The EU group excludes the UK, as discussed in Section 3.2. Event time t = -1 indicates the base year, 2011/12. Controls include annual provincial rainfall and pre-policy values of the average proportion of the year workers worked on the farm, the proportion of male workers on the farm, and the workers' average age. Standard errors were clustered at the firm level. The sample consists of farmers who primarily export fresh fruit and vegetables (defined as fresh fruit and vegetables comprising at least 90% of their export revenue) that existed in 2011/12. The sample only includes firms that employed low-income individuals, defined as those who consistently earned below ZAR6,515 per month in December 2021 prices.

Source: own illustration using version 5 (beta) of the IRP5 data and extraction 5, version 1 of the transactional-level Exports Customs data (National Treasury and UNU-WIDER, 2023a, 2023b).

Figure A1 shows the weighted results and in some instances smaller and larger farms are making larger adjustments. For instance, farmers who export their highest export value to the EU increased the fraction worked for one year in 2012/13 while, for the unweighted sample, no statistically significant effect exists—the adjustments were thus driven by larger farms. For those that export to SADC (where SADC is not the main trading partner), large farms decreased the fraction of year worked while the unweighted regression had no statistically significant effects. Among those that export their highest export value to SADC, the weighted and unweighted regressions showed that the fraction worked decreased in the last year of the period of analysis, but the adjustment was much larger among the unweighted regression, suggesting that smaller farms adjusted it more. When comparing the weighted to unweighted regressions among farmers who exported most frequently to SADC, one observes that the decrease in fraction of year worked was concentrated among smaller farms. For farmers whose main trading partner is outside of the EU and SADC, the increase in the fraction of year worked is only visible among the unweighted sample, which suggests that the smaller farms were adjusting this more.