School of Economics at the University of Cape Town

Structural Adjustments to the Farm Labour Force, 1994-2011: A Mincerian Exploration of Returns to Education and Experience

A dissertation submitted to the Economics Department, Commerce Faculty, University of Cape Town, in partial fulfilment of the requirements of the award of a Masters in Commerce (Economic Specialisation)

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ABSTRACT

Agriculture is a vital source of employment and income for many unskilled workers in South Africa. However, due to the decline in the sector's contribution to Gross Domestic Product (GDP) (as a result of the reduction in agricultural production and an increase in the contribution of the manufacturing and services sectors) (Department of Agriculture, 2010), this vital role is diminishing. With changing economic conditions and the implementation of agricultural legislations, such as ESTA, most farm workers' living standards have decreased. Many farm workers earned significantly less than other unskilled workers therefore, to improve their wages, a minimum wage was introduced. However, the minimum wage only increased the wages of farm workers who were still employed as many were retrenched. Since the impact of the minimum wage on employment and wages has been thoroughly studied this paper seeks to determine whether the introduction of the statutory agricultural minimum wage, in 2003, restructured the agricultural labour force. The paper will use the Mincerian wage equation to estimate the returns to skills (education and experience) in order to determine if the productivity of farm workers was affected. The paper finds that educational attainment increased for farm workers and was rewarded by farmers, as the return to education increased. Experience increased for farm workers as well but was not rewarded accordingly, as there was a reduction in the return to experience. Therefore, farm owners prefer a more educated agricultural workforce to a more experienced workforce, as they are willing to offer higher wages to educated farm workers. Evidently, the minimum wage has restructured the workforce to be more productive, but since the same trends were seen for the control group, economic conditions also affected the agricultural workforce. The policy implications of this are that farmers discriminate against younger farm workers, which adds to the increasing youth unemployment problem in South Africa.

Keywords: Agriculture, Minimum wage, Mincer Wage Equation, South Africa

1. INTRODUCTION

Poverty and inequality are pressing and important issues to many policy makers in South Africa. The country is ranked as an upper middle income country; nonetheless poverty and inequality are still rife due to policies implemented during Apartheid (Pauw, 2007; Khumalo, 2013). In 2009, South Africa had a Gini index[1] of 63.1 and a poverty headcount ratio[2] of 23 percent in 2006 (World Bank, 2014). Although the Gini index is quite high, indicating a high level of inequality, it has decreased from 67.4 in 2006. The same decrease has occurred in the poverty headcount ratio, decreasing from 38 percent in 2000 (World Bank, 2014). The reduction in these two economic indicators is a promising indication that South Africa is attempting to rectify past policies.

Poverty is mainly a rural phenomenon in South Africa and agriculture is the only employer of note in rural areas. However, agriculture is providing an insignificant number of jobs (Khumalo, 2013). Pauw (2007) found that agriculture also contains the most unequal distribution of income. The sector had a Gini coefficient of 0.73 (a Gini index of 73) in 2000 which was driven by the difference in wages between Africans and Whites. In agriculture, Africans make up 95.8 percent of the total agricultural employment but earn only 48.3 percent of the income (Pauw, 2007). South African agriculture plays an important role as an employer of labour (Newman, Ortmann and Lyne, 1997). However, it seems that growth in the agriculture sector is volatile and low, and has a negative impact on the number of jobs available. Many of the challenges that farm workers face are also due to policies that were implemented during the Apartheid era, in which agriculture was seen as a capitalistic sector where Africans were exploited with low wages (Hall et al, 2013). Du Toit, Kruger and Ponte (2008) state that in 2003 the wine industry was the last industry to transition into "the new South Africa" as the industry was characterised by white-dominated power, the exploitation of blacks, dire working conditions, poor wages, institutions that degraded farm workers (such as the *dop system*[3]), and an industry that had authoritarian and racist white employers. Du Toit, Kruger and Ponte (2008) argued that the relationship between farmers and farm workers could be compared to the relationship between a master and his slaves. Before democracy, in

[1] The Gini Index measures the extent that the distribution of income, for individuals or households, deviates from a perfectly equal distribution. A Gini index of 0 indicates perfect equality whereas a Gini index of 100 indicates perfect inequality (World Bank, 2014).

[2] The poverty headcount ratio at national poverty line is measured as a percentage of the population and indicates the percentage of the population that lives under the national poverty line (World Bank, 2014).

[3] Farm workers were partly paid in alcohol (wine) and partly paid in cash.

1994, farm workers lives occurred within the white fences and they were dependent on farmers for their livelihoods, such as: wages, housing, water and electricity and, in some cases, food and drink. Furthermore, if a farm worker lost his/her job then the farm worker's home was lost as well (du Toit, 1993). It is because of these characteristics and relationships that farm workers are among the poorest in the country (Naidoo, Klerck and Manganeng, 2007).

Since 1994, the new South African government has attempted to improve the livelihoods of farm workers by implementing various laws that affect agriculture, such as the Labour Relations Act of 1995, the Basic Conditions of Employment Act of 1997 (BCEA), and Extension of Security of Tenure Act of 1997 (ESTA). Ironically none of these were able to stem the tide of change so that now farm workers face various insecurities in their employment, tenure, and livelihoods. Due to agricultural deregulation, trade liberalization, tenure reforms and the lifting of price controls on key farming inputs, costs to farmers have increased causing labour shedding or casualisation (Barrientos and Kritzinger, 2004). The increase in labour and farm costs have caused the number of commercial farms to decrease from 60 000 in 1996 to 40 000 in 2007 and the agricultural workforce to decrease from 921 000 in 1994 to 628 000 in 2005 (Hall et al, 2013). Labour shedding and casualisation have become great problems for farm workers. The shift to seasonal labour was greatest between 1995 and 2000 (du Toit, 2004) which coincided with the implementation of the agricultural laws, and is seen as the reason for casualisation. The shift away from permanent workers has meant that farm workers who were living on the farm may have lost their homes as well as experienced an increase in asset poverty and an increase in unemployment. Hence, even though there is a move to casualisation, the number of jobs available is still low (Ewert and du Toit, 2005; Hall et al, 2013).

In addition, there still exists a prominent gender inequality within farm workers. Women still earn significantly less than men. In most cases, women are only employed on farms due to their spouses or partners being employed on the farm (Conradie, 2003), usually as temporary workers who do not receive the benefits that permanent staff would receive. Furthermore, it has been argued that the wage difference was justified since men perform more physically demanding jobs, such as irrigation, spadework, and operating heavy machinery. On the other hand, women perform less physically demanding jobs such as packing and sorting of fruit. Aside from the types of jobs that men and women perform, there seems to be an underlying

psychological view by women, who think that it is irrational for men to perform the same work women do, as it would affect the men's self-worth (Kritzinger and Vorster, 1996).

Evidently, the agricultural laws have not been successful in reducing the wage gap between Whites and Africans in agriculture. Therefore, the minimum wage was introduced, as a method for reducing poverty (Development Policy Research Unit, 2008). However, the implementation of a minimum wage is a controversial topic, as wages are increased at the cost of employment (Card and Krueger, 1993; Bhorat, Kanbur and Stanwix, 2012), leading to two situations: workers who are still employed and earning a higher wage; and workers who were previously employed but are no longer. In South Africa minimum wages are implemented sectorally and were first introduced in the Contract Cleaning sector in 1999 (Bhorat, Kanbur and Mayet, 2013). The minimum wage in agriculture was introduced in 2003 and has created a wealth of studies. Conradie (2003) found that job creation of permanent workers slowed-down. Murray and van Walbeek (2007) concluded that both farmers and farm workers bear the costs of the minimum wage and Bhorat, Kanbur and Stanwix (2012) found that wages increased, while employment decreased.

Therefore, this paper adds to existing literature by determining if the introduction of the statutory agricultural minimum wage, in 2003, restructured the agricultural labour force and, if so, how. The Mincer (1974a) wage equation will be used to determine the impact of the minimum wage on the return to skills (education and experience) - in order to determine the impact on productivity - using the PALMS dataset. This is interesting as there have been no studies conducted on whether agricultural employers retained higher skilled farm workers after the minimum wage was introduced, as labour shedding had occurred. Furthermore, the effect on skills (education and experience) is important as productivity is one of the key driving forces of economic growth, which increases living standards and affects business cycles, inflation, exchange rates and other macroeconomic variables (Khan et al, 2010).

The paper focusses on six provinces - Western Cape, Eastern Cape, Free State, KwaZulu-Natal, Mpumalanga, and Limpopo – as these provinces have the most agricultural households[4] (Statistics South Africa, 2014a). Even though the Western Cape has a small percentage of agricultural households, 5.2 percent (Statistics South Africa, 2014a), the Western Cape is export-orientated and labour-intensive as well (du Toit, 1993; Kritzinger and

[4] The percent of agricultural households is used as an indicator of commercial farming as it provides an indication of the number of households who are dependent on commercial farming for their livelihoods.

Vorster, 1996). In addition a control group, consisting of unskilled workers in: mining and quarrying; transport; construction; trade; manufacturing; finance; services; utilities; and domestic services, will also be estimated to determine if the return to skills of farm workers was affected by the minimum wage or by economic conditions.

The paper is set out as follows: section two discusses two agricultural laws, the minimum wage and ESTA, as well as skills; section three discusses the Mincer (1974a) equation and its applications; section four provides the data and methodology used in the paper; section five provides the results of the empirical model, section six discusses the policy implications of the findings of the paper; and section seven provides the conclusion.

2. AGRICULTURAL LAWS AND THE IMPORTANCE OF SKILLS

2.1 Minimum Wage:

Statutory minimum wages have been a topic of interest for many studies as there are both positive and negative impacts on the labour force. Studies have found that wages increase but at the cost of employment. This section will discuss the theory of minimum wages, the agricultural minimum wage in South Africa that was introduced in the Sectoral Determination for Farm Workers in 2002, and past international and South African studies on the minimum wage.

2.1.1 Theoretical Impact of Minimum Wages:

Wages in any labour market are determined by supply and demand of labour. Figure 1 depicts how a minimum wage affects wages and employment in a labour market using a partial equilibrium model. A partial equilibrium model is used as only the supply of and demand for labour is considered. In Figure 1, the equilibrium wage (W_E) is the point at which the supply of labour (S) and demand of labour (D) interact (E). At this stage, the economy experiences full-employment equilibrium (L_E). The minimum wage is introduced at W_M and is set above the market clearing price of W_E. From Figure 1 it is clear that the introduction of the minimum wage leads to unemployment as labour supplied (L^S_M) exceeds labour demanded (L^D_M). Therefore, a minimum wage leads to an increase in wages but a reduction in employment (Development Policy Research Unit, 2008).

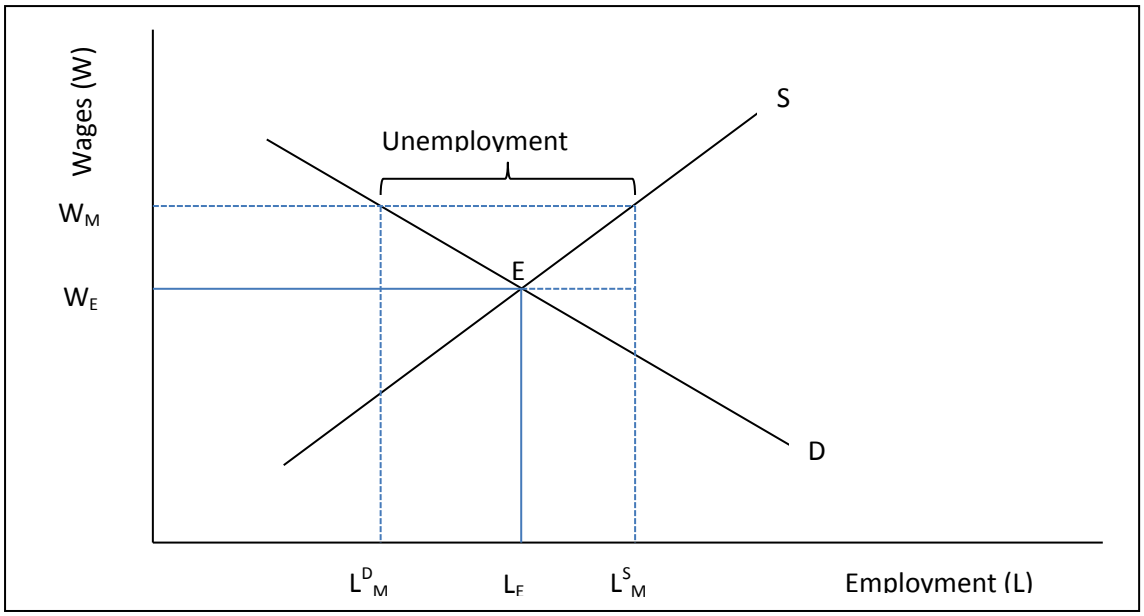

Figure 1: Impact of Minimum Wage on the Labour Market
Source: Development Policy Research Unit, 2008

2.1.2 Minimum Wage Legislation:

In an effort to reduce poverty in agriculture, a minimum wage was introduced through the Sectoral Determination for Farm Workers and was implemented from the 1 March 2003 (Development Policy Research Unit, 2008). The Sectoral Determination for Farm Workers was first published in 2002, as the Sectoral Determination for Farm Workers: Schedule 8, and there have been updated versions of the publication as the Sectoral Determination for Farm Workers: Schedule 13. The Sectoral Determination for Farm Workers forms part of the Basic Condition of Employment Act 75 of 1997 and provides all labour related issues of farm workers, such as: minimum wage (calculation of wages, payment and deductions); particulars of employment; hours of work; leave; prohibition of child and forced labour; and termination of employment. According to the Act, a farm worker includes: a farm worker; a domestic worker employed on a farm; and a security guard employed on a farm to guard the farm (Department of Labour, 2013).

On the 1 March 2003 the statutory minimum wage for agriculture came into effect. It stipulated that an employer must pay a farm worker at least the minimum wage to: farm workers who work more than 27 ordinary hours of work per week at least the monthly wage; and farm workers who work 27 or less ordinary hours per week at least the hourly rate. Under deductions, it allowed that an employer may not make a deduction that is greater than 10 percent of the farm worker's wage. Deductions may only be made with regards to

accommodation or food, housing and payments towards medical aid, insurance, trade union subscriptions, bank payments, rent and holiday or sick fund (Department of Labour, 2002). Furthermore, the minimum wage was implemented in a two part system. Farms were divided into two areas: Area A, where the minimum wage was higher as the area has higher per capita gross geographic product and includes wine farms; and Area B, where the minimum wage was less than Area A. In addition, Area A consisted of municipalities that had an average household income of R24 000 per annum in the 1996 Census and Area B had an average household income of less than R24 000 per annum. From 2009, the two part system for the different minimum wage levels was eliminated (Department of Labour, 2002; 2006; 2009; 2013; Naidoo, Klerck and Manganeng, 2007).

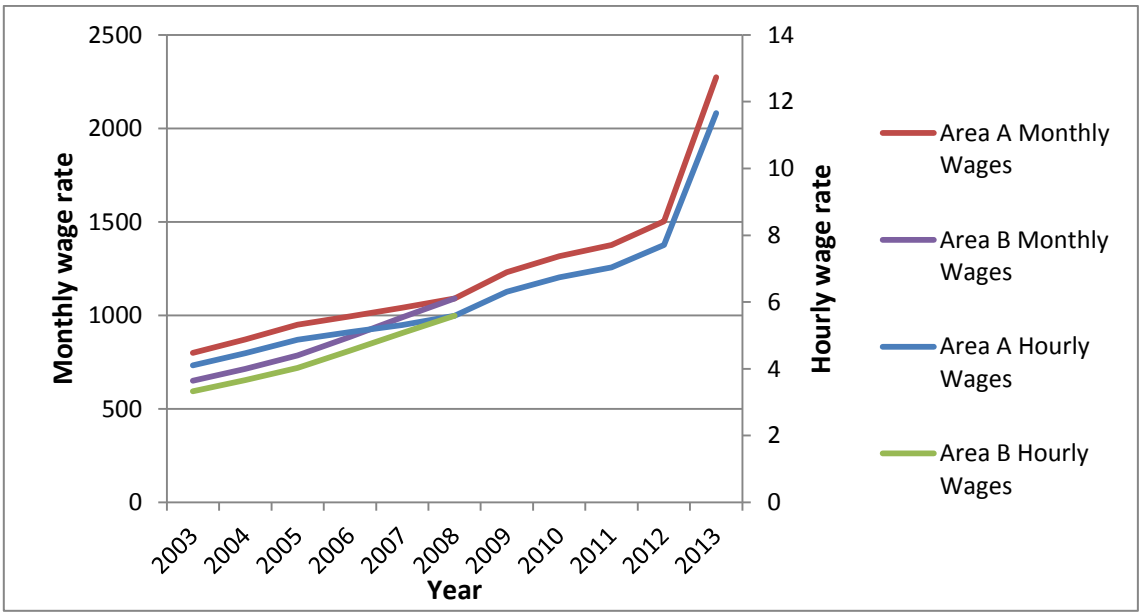

Figure 2: Minimum wage increases since 2003 for Area A and B
Source: Department of Labour, 2002; 2006; 2009; 2013
Note: All statutory minimum wage increases are effective from the 1 March of that year and are in nominal South African Rands

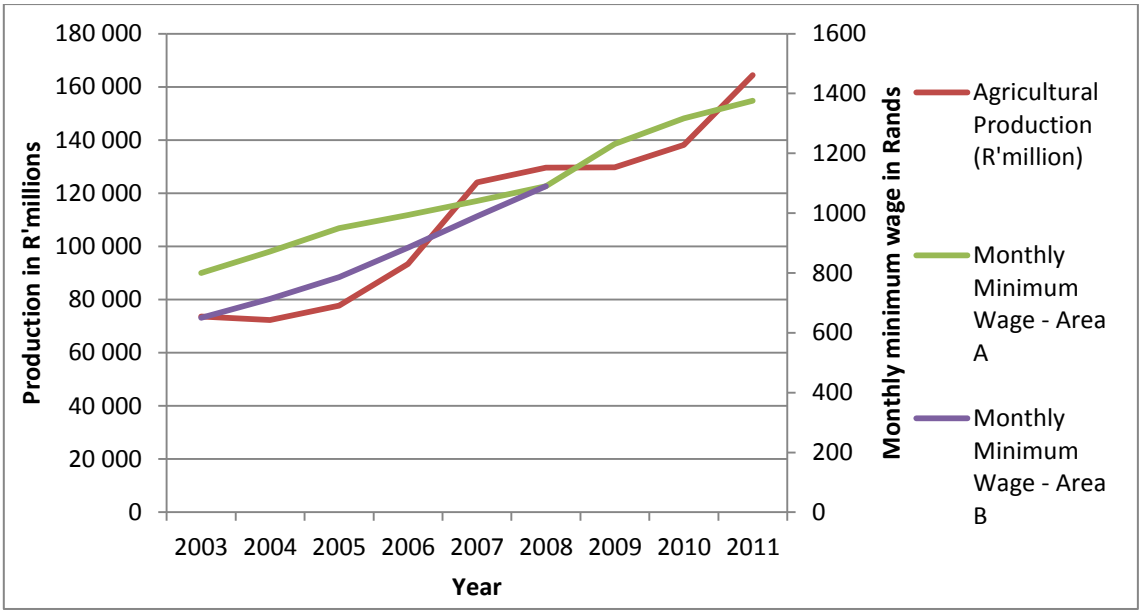

Figure 3: Agricultural production versus the minimum wage, 2003-2011
Source: Department of Agriculture, Forestry and Fishing, 2013a
Note: Agricultural production and the monthly wage rate are in nominal values

Figure 2 illustrates the increases in the statutory agricultural minimum wage from 2003. Evidently there is a large difference between the minimum wage implemented in Area A and the minimum wage in Area B, although both the hourly and monthly wage rate for Area B gradually moves towards the same wage rate as Area A. The minimum wage increases gradually from 2003 to 2011. From 2012 there was a sudden rise in the wages: from a monthly wage of R1 375.94 to R1 503.90, with the monthly wage increasing by 9.3 percent (Appendix I: Table A1). Figure 3 shows a decline in the gross value of agricultural production when the minimum wage was introduced however, the value of agricultural productions increased as the minimum wage was increased from 2004. Furthermore, as the minimum wage increased from 2007 to 2009, so did the value of agricultural production. Therefore, it seems that the increase in the minimum wage from 2004 did not impact the productivity of farmers.

2.1.3 Minimum Wages and Employment:

There is a wealth of international literature on minimum wages. Many studies have found that minimum wages led to an increase in wages but also a reduction in employment. Since this paper employs the Mincer (1974a) wage equation, it is important to note that Mincer (1974b) also investigated minimum wage and was among the first to determine the effects of minimum wage. Mincer investigated the employment and unemployment effects of minimum

wage implementation and found that income did not increase, while unemployment increased.

One study that applies the Mincer (1974b) model is Tauchen (1981), in which the paper tested the results of the Mincer (1974b) study to determine the effect of an increase in the minimum wage in the covered versus uncovered sectors. The paper found two effects: the first was a scale effect in which total employment declined with the increase in the minimum wage; and the second was the substitution effect in which low-wage employment decreased but higher-wage employment increased. Hashimoto (1982) investigated the relationship between minimum wages and on the job training for men in the United States, using the National Longitudinal Survey of Young Men, collected in 1969. The paper found that the minimum wage reduced trainings as individuals were retrenched and the remaining employed workers experienced a reduction in training due to the increase in labour costs. Card and Krueger (1993) studied the impact of the increase in the minimum wage in New Jersey by comparing the changes in wages, employment and store prices before and after the increase. The changes were also compared to Pennsylvania, where the minimum wage remained the same. The study focussed on 410 fast food restaurants and found that the minimum wage did not have an impact on employment as the higher labour costs were passed on to consumers, through an increase in fast food prices.

Mincer and Leighton (1981) found that on-the-job training reduced after the minimum wage was introduced in United States. Job training was reduced as the training had to be financed by the employer, which would increase labour costs as employers had to provide a minimum wage and training. Although the paper did not investigate the impact of the minimum wage on schooling, the paper found that the rate of return to education increased for low-income workers and that the incentive to attain education became higher. Adding to the argument of human capital, Flug and Galor (1986) investigated the theoretical implications of the minimum wage on international trade and human capital. They found that the minimum wage created unemployment for the unskilled labour force as there was a production shift towards skilled labour. Furthermore, Agell and Lommerud (1997) found that the minimum wage had positive effects on human capital development in the primary sector. The minimum wage increased the productivity requirement of firms: firms would prefer to hire more productive workers, and created an entrance barrier (a worker will only be considered for the job if

minimum education requirements are met). However, this is with regards to individuals who had some level of skills.

In addition to international studies, there have been various studies conducted in South Africa that discuss the impact of the agricultural minimum wage on both farmers and farm workers. Before the introduction of the minimum wage, Vink and Tregurtha (2003) reviewed the international literature on minimum wages. They concluded that many studies discussed, in their paper, highlighted that the loss of jobs was far greater than the gain of jobs and that some studies did provide some positive effects, such as an improvement in human capital as the welfare of skilled workers increased. Furthermore, firms that had unorganised labour were more likely to pay wages that were lower than the average. Therefore, the minimum wage would increase the dynamic efficiency of firms ensuring that wages were in line with the social costs of labour. In addition, unemployment may not have been the result of higher wages.

Within six months of the minimum wage introduction, Conradie (2003) investigated the impact of the minimum wage. The study focussed on two areas: Worcester in Area A and Robertson in Area B. Conradie (2003) highlighted that agriculture had suffered large labour shedding for the last thirty years. When employment fell, workers tended to earn more. During different times of the year, farm workers earned different amounts: during harvesting, farm workers earned more as most do piecework. Furthermore, men were the most important for farmers and considered them their "real" workforce. The most significant impact of the introduction of the minimum wage was a slow-down in the job creation of permanent workers and not a direct loss of jobs. In addition, farm workers had less job security and costs increased for farmers.

In a follow up paper, Conradie (2005) investigated the wage elasticities of wine farms in the Western Cape. The paper found that at higher wages, the number of permanent men employed was reduced. Furthermore, employment was created if the cost of fuel was expensive as fuel is used to run machinery. Conradie (2005) further found that the minimum wage had a positive effect on the product price of wine: if the product price rose, farmers could meet the increase in the minimum wage with ease but if the product price fell, farmers were not able to meet the minimum wage, especially if it increased.

Murray and van Walbeek (2007) investigated the impact of the statutory minimum wage on farm employment in KwaZulu-Natal. It too found a decreasing trend in employment since 1970. The study also noted the effects of the Basic Conditions of Employment Act (1983, extended to agriculture in 1993), the Labour Relations Act (1995) and the Extension of Security of Tenure Act (1997). The Sectoral Determination was expected to change the labour structure of farm workers as an increase in wages would incentivise farmers to substitute permanent workers for contract or seasonal workers. The paper found that both farmers and farm workers bore the costs of the minimum wage, as farmers had to contend with higher labour costs and farm workers faced the risk of retrenchment.

Another study that examines compliance with minimum wage legislation in agriculture is Naidoo, Klerck and Manganeng (2007) and was conducted in Makana, Ndlambe and Sunday's River in the Eastern Cape. The study provided an in-depth detail of how the Department of Labour ensured compliance with the minimum wage but also discussed the inadequacies of the low level of compliance. These inadequacies were that a small portion of employers were inspected and there was limited enforcement by the department. The Sectoral Determination 8 increased wages of farm workers, improving their standard of living but farmers were still not complying with the legislation. In particular: the issuing of payslips, payment for overtime, working on Sunday's or public holidays, and deductions. However, compliance was higher in Area B than A since the minimum wage rate was lower in Area B, a similar finding to Conradie (2003).

Following the research conducted by Conradie (2005), Sparrow et al (2008) estimated the long-run wage elasticities of the demand for regular labour in South African agriculture in order to test the suitability of the new agriculture legislation. An increase in labour costs motivated farmers to replace farm workers with mechanisation, labour contractors or new technologies leading to an increase in unemployment. This implied that casual labour was a substitute for regular farm labour. The number of regular workers fell by 4 percent (756 397 to 728 414) from 1960 to 1990 and by 34 percent from 1990 to 2002. These legislations had increased both monetary and non-monetary costs for commercial farmers. The demand for labour has become more price elastic since the implementation of the agricultural legislation and encouraged farmers to substitute regular farm labour with casual labour due to lower wages, lower transactional costs and lowers risk of industrial action.

Lastly, Bhorat, Kanbur and Stanwix (2012) investigated labour market outcomes due to the implementation of the minimum wage in agriculture, specifically on farm workers. The South African Labour Force Survey (LFS) from 2000 to 2007 was used, with each year having between 2 000 to 2 800 observations. Bhorat, Kanbur and Stanwix (2012) estimated wages using a difference-in-differences model, as Mincer (1974a) and Card and Krueger (1993) had applied. The study found that farm worker wages increased due to the implementation of the minimum wage but, as previous studies found, employment decreased.

2.1.4 Conclusion:

Theoretically, the implementation of a minimum wage will lead to an increase in wages but a reduction in employment, which previous studies have all found. Although Vink and Tregurtha (2003) highlight a few positive impacts no South African studies have found similar results**.**

2.2 Extension of Security of Tenure Act 62 of 1997 (ESTA):

Although this paper seeks to determine if the minimum wage had an impact on productivity, the Extension of Security of Tenure Act 62 of 1997 (ESTA) is agricultural legislation that also had an impact on the agricultural labour force. It is therefore, important to determine if changes to the labour force happened due to ESTA, the minimum wage or economic conditions. This section will discuss the Extension of Security of Tenure Act 62 of 1997 (ESTA) by briefly describing the legislation and discussing past studies.

2.2.1 ESTA legislation:

ESTA was implemented in order to secure the tenure rights of farm dwellers and to prevent illegal and unfair evictions. The Act aims to bring balance to both the farm owner and occupier[5] by placing rights and responsibilities on both parties and providing procedures through which an occupier can be evicted (Hall, 2003). The Act sets out to: "protect occupiers against unfair evictions by a landowner; sets out the rights and duties of owners and occupiers, which include the rights to human dignity, privacy, freedom and security of the person, freedom of religion, belief, opinion and of expression, and the freedom of movement; regulates the conditions and circumstances under which the right of people to

[5] An occupier is a person living on the land which belongs to another person (this person is the land owner or person in charge). The occupier constitutes farm workers or workers who work in surrounding businesses and their families (Chenwi, 2008).

reside on land may be terminated; regulates the conditions and circumstances under which people whose right of residence has been terminated may be evicted from land; provides special protection to occupiers who are over 60 and have lived on the land for ten years or more or are employees or former employees and because of ill health, injury or disability are unable to supply labour; and criminalises unlawful evictions under the Act" (Chenwi, 2008).

The Act states that no occupier can be evicted off land that he or she has permission to be living on, without a court order. ESTA only applies in rural areas and creates a procedure to be used when applying for an eviction order to evict occupiers (Wegerif, Russel and Grundling, 2005).

2.2.2 Previous studies:

Various studies have been conducted within South Africa to determine the impact ESTA had on the agricultural labour force. ESTA was meant to ensure the tenure security of farm workers but created many issues, such as unemployment and a movement towards casualisation. The studies, below, discuss the impact of ESTA and the reasons as to why ESTA was ineffective

Hall (2003) states that the number of evictions over the period 1988 to 2002 had been on the increase although the number of threatened evictions were far greater than the number of actual evictions. In addition, in Limpopo Hall et al (2013) found that evictions were taking place but without any legal processes. It was further found that farm dwellers had become accustomed to evictions as a way of life and did not think of evictions as the generic definition of land evictions, as there were a range of evictions, such as: the eviction of entire families; destruction of occupier dwellings; evictions of individual family members (most probably the breadwinner in order to force the families off the land); and some families had managed to secure tenure on farm land but were unable to secure a form of income, through employment on that farm. Weideman (2004) stated that farm workers in Mpumalanga found that land evictions were continuing at the same rate as during Apartheid. Hence, ESTA was not curbing the amount of evictions.

Roodt (2006) found that ESTA was ineffective due to: lack of knowledge about the law by the occupiers; a lack of communication from the state with regards to rectifying the problems that arose due to ESTA, collusion between farm owner and rural magistrates, and administrative ineffectiveness from the State with regards to ensuring that all legislation with

regards to land reform were met. Hall (2003) provided a different reason as to why ESTA was ineffective, stating that it was the judicial system that failed ESTA and that ESTA legislation had not been effective in preventing evictions but rather in regulating evictions. Weideman (2004) found that ESTA was ineffective due to: implementation which included the lack of capacity of the Department of Land Affairs (now the Department of Rural Development and Land Reform); weak enforcement (farmers managed to exploit the loopholes of the legislation or circumvent it); and failure to publicise the Act. In addition, Hall, Kleinbooi and Mvambo (2001) provided further reasons as to the lack of effectiveness of ESTA. First, the judicial system (police and magistrates) did not consider illegal evictions to be 'crimes' and did not take effective actions. Secondly, legal expertise was required to be brought for occupiers threatened with eviction however; paralegals were not allowed to defend their clients in formal court.

Furthermore, organisations such as Sikhula Sonke and the South African Human Rights Commission (2003) found that ESTA had been ineffective. Sikhula Sonke, a women farm workers' trade union, which is discussed by White (2010), found that ESTA had led to farmers being reluctant to have farm workers on farms when in fact ESTA was meant to decrease the vulnerability of farm workers to arbitrary evictions. The South African Human Rights Commission (2003) argued that there had been a large number of pre-emptive evictions and, due to ESTA being implemented poorly, there has been an increase in illegal evictions.

Hence, from previous literature, ESTA has not been as successful as the legislation was meant to be, as evictions increased leading to an increase in unemployment.

2.3 The importance of skills:

Aside from agricultural minimum wages, this paper also focuses on returns to skills. Skills can be defined as [sic] "acquired fitness (resulting out of training and adaptation) or intelligence or any natural endowment which helps individuals to do a job more efficiently than other individuals" (Roy, Mozumdar and Kar, 2005) and can consist of education and work experience (Juhn, Murphy and Pierce, 1993).

King, Montenegro and Orazem (2012) attempted to determine if Theodore Schultz's (1975) theory, that differences in the returns of skills are the reason for income differences in countries, holds. The paper found that the theory did hold and that private returns to

schooling were higher in countries which were more economically free, even when political institutions were added to the model. Therefore, migration from economically oppressed countries to economically free countries results in individuals earning higher returns to human capital.

Haskel and Martin (1993) investigated whether lack of skills reduced productivity in the United Kingdom. The study found that skill shortages reduced productivity and that economic growth was not as large as it could have been had more skills been available. Furthermore, productivity could be increased by increasing the level of education and training. In addition, Roy, Mozumdar and Kar (2005) found that, on average, higher skilled workers were more productive than low skilled workers in Northern West Bengal in India. In contrast, Irzano, Schivardi and Tosetti (2008) discussed the relationship between workers' skills and firm productivity, in order to assess if workers' skills were complementary or substitutable. They found that having a mix of low skilled and high skilled workers was beneficial for productivity and that low skilled workers had a positive effect on productivity.

Guadalupe (2007) investigated if competition affected the return to skills. Imperfectly competitive industries normally generated high monopoly rent, resulting in higher wages. The paper found that competition increased returns to skills as employees' skills were rewarded as competition increased. The effect was most strong in industries that were strongly unionised and Research and Development (R&D) intensive.

Bolliner, Ziliak and Troske (2011) studied whether the changes in the wage gap were a result of changes in skills and changes in returns to skills in Appalachia. The paper found that education and experience were both important determinants for wages. In addition, Appalachian men and women suffered from "missing markets", which was the lack of high-skilled workers and low return to skills. This has created the wage gap between urban Appalachia and the rest of urban America.

The above studies have highlighted that skills have an important impact on the productivity of a firm and subsequently, on the economy of a country. While some studies found that higher skilled workers are more productive, there is evidence that having a mix of low and high skilled workers is the most beneficial for a firm. However, higher returns to skills are found in unionised and R&D intensive industries, which the South African agriculture industry is not.

3. MINCER EQUATIONS

The paper will employ the Mincer (1974a) wage equation to determine the impact of the agricultural minimum wage on the return to skills. The Mincerian wage equation is one of the most utilised earning functions and can be used to estimate the returns to schooling, returns to schooling quality and the returns to experience for male-female wage gaps (Heckman, Lochner and Todd, 2003). It is, therefore, important to discuss how the model is applicable to the paper. In perfect competition wage is equal to the marginal product of labour multiplied with marginal revenue[6], the interest rate is the marginal product of capital multiplied by the marginal revenue and profit is maximised. Profit is a function of revenue and costs and is zero as firms can enter and leave the market. In order to ensure that profit is maximised, firms need to increase revenue by increasing firm productivity (Varian, 1992, pg. 216). Firm productivity is a function of worker productivity, as discussed in the skill section; however worker productivity is difficult to observe. Since firms will be price takers, changes in productivity, which is equal to marginal product of labour, will be perfectly proportional to changes in wages. As wages are observable, the Mincer wage equation shows the impact of worker characteristics on wages. Therefore the Mincer wage equation can be used to illustrate the productivity of workers, and ultimately the firm productivity.

3.1 Theoretical Mincer Model:

Mincer (1974a) found that the earnings model focused on the life-cycle model of earnings and the relationship of observed earnings with net investments in human capital. The Mincer (1974a) proxied human capital with schooling alone and disregarded post-school investments.

The Mincer (1974a) model is as follows:

$$\ln[w(s, x)] = \alpha_0 + \rho_s s + \beta_0 x + \beta_1 x_2 + \varepsilon \qquad \text{(Equation 1)}$$

Where:
ln[w(s,x)] is the natural logarithm of wage at schooling level, s, and work experience, x;
ρ is the rate of return to schooling; and
ε is the residual.

[6] $w = MP_L.p$

Equation 1 provides two economic concepts: a pricing equation which describes how the labour market rewards productivity, such as schooling and work experience; and rate of return to schooling (Heckman, Lochner and Todd, 2003). The model further depicts the relationship between observed earnings, potential earnings and human capital investment, where human capital consists of formal schooling and on-the-job training. According to the human capital model, education is an investment of current resources in exchange of future returns (Heckman, Lochner and Todd, 2003; Fiaschi and Gabbriellini, 2013). As previously stated Mincer (1974a) writes actual (or observed) earnings as a function of potential earnings less investment costs. Investment costs are the cost of purchased inputs and foregone earnings (opportunity cost of earnings lost due to training or studying rather than working) (Polachek, 2007).

3.2 Is the Mincer equation still relevant?

It has been forty years since the Mincer equation was published and therefore, it needs to be determined whether the Mincer (1974a) equation and theory, upon which it is based, are still relevant. While there are papers which still use the equation, publications using the equation have tailed off since 2001. This section will discuss whether the equation is still applicable in today's world.

Lemieux (2003) provided an in-depth discussion about the relevance of Mincer's "human capital earnings function" and analysed each variable used in the model. The model, which consists of the log of earnings as the dependent variable with linear independent variables, still makes economic sense. The log of earnings is used as the log function captures the multiplicative effects of education on human capital. The linear formulation of education is also still relevant as every year of education has been found to have a direct impact on earnings as shown by Card and Kreuger (1992). On the other hand, experience needs to be adjusted, by adding higher order polynomials to potential experience; or else the wage growth of younger workers would be understated. Furthermore, when applied to recent census data, the earnings function did not fit the data as well as the data that Mincer used for the 1974 study (the 1960 census). The reason for the difference was that experience-wage profiles were no longer parallel for different education groups. Overall, Lemieux (2003) found that the Mincer equation is still an accurate benchmark in a stable environment.

3.3 Applications of the Mincer wage equation:

Although the Mincer wage equation is used to determine the returns to schooling, the equation has been used to determine other effects on wages. The next section will focus on previous studies that utilised the Mincer wage equation (equation 1) and will be divided into the following categories**:** returns to schooling, returns to other human capital investment, and studies performed in South Africa.

3.3.1 Returns to schooling:

Mincer (1974a) laid down the foundation for estimating the returns to education and many studies have since utilised the Mincer wage model to determine the returns to education. Fersterer and Winter-Ebmer (2003) investigated the returns to education in Austria. The paper used the Austrian Mikrozensus for 1981 to 1997 with a sample size of 400 000 households. The authors found declining returns to schooling, especially for secondary schooling and secondary vocational colleges. The largest decline in return to education was for tertiary education, with the return dropping by 30 percent from 1981 to 1997. Contrary to Fersterer and Winter-Ebmer (2003), Cooper and Cohn (1997) and Salas-Velasco (2010) found positive returns to university education.

Tansel and Bircan (2010) focussed on a developing country, Turkey. The paper investigated gender inequality using the Mincer (1974a) equation but provided some insight into returns to education. The paper used the 1994 Household Income and Expenditure Survey and the 2002 Household Budget Survey, and had a sample of 26 256 households for 1994 and 9 600 households for 2002. The authors found that there were positive returns to education and that these returns increased with the various levels of schooling.

In the following year, Tansel and Daoud (2011) compared the return to private education in Palestine and Turkey for the period 2004 to 2008. The returns for schooling were positive for both Palestine and Turkey but the return was lower in Palestine. The difference was due to Palestine having fewer people with master's degrees and few job opportunities for such individuals. The same results were found for returns to experience.

Fiaschi and Gabbriellini (2013) inspected the returns to education in Italy between 1995 and 2010, over a sample of 2000 to 4000 households depending on the wave used. The paper went further by determining the effects of different education levels and types of schools. The

study found that the returns to education had not changed over the investigated period, however more years of schooling lead to a greater wage return.

Liao and Zhao (2013) investigated the returns to education for disabled people in China, who are rarely economically discussed, while controlling for education. The paper established that disabled people in rural areas have a lower return to education than in urban areas. This is understandable as the level of education is higher in urban areas. Furthermore, disabled people who live in urban areas experienced a negligible return to education. This occurred as they require more needs which reduced their level of income.

With the above papers stating that education increases wages, Jones (2001) investigated whether educated workers were really more productive than less educated workers. Productivity was measured by workers' earnings'. The data used is from the panel survey of Ghanaian manufacturing firms over 1992 and 1994 and had a sample size of 1 211. The paper found that there was a positive correlation between education and productivity, indicating that more educated workers were more productive, and that firms pay employees according to productivity. Similarly, Cooper and Cohn (1997) found that investments in human capital (such as education) increased the productivity of an individual.

3.3.2 Returns of other human capital investment:

While there have been a number of studies done on returns to education, there have been equally the same amount completed on the returns to productivity. Stanley (1982) investigated whether a student labour force (students working while studying) had an impact on post-enrolment wage rates. The study used data from the National Longitudinal Survey, from the United States of America (US), from 1966 to 1971 and had a sample size of 5 000 individuals. The paper found that students who worked while studying had access to financial aid and job experience which led to more productive and higher-paying jobs after they left university.

In another paper, Vijverberg (1986) examined the wage difference between market and self-employment in Malaysia, using the Malaysian Family Life Survey (MFLS) of 1976. The sample size was 871 households. The author found that the accumulation of human capital raised an individual's productivity more as a market worker than a self-employed worker.

As developing countries are receiving more attention, studies focussing on the accumulation of human capital in these countries have arisen. Anyanwu (1998) studied the role of human capital on the income earnings of Nigerian men. The data was drawn from a survey of 682 households in six Nigerian states: Anambra, Borno, Cross River, Ogun, Plateau, and Sokoto. The study found that human capital impacted positively on income, especially with regards to educational attainment and having an excellent health status.

Bigsten et al (2000) added to the African literature by addressing four policy questions for five sub-Saharan countries (Cameroon, Ghana, Kenya, Zambia and Zimbabwe). The sample size was between 1 900 and 2 600 households, depending on the country being estimated. The main aim of the paper was to determine the returns to physical and human capital in the manufacturing sector using both individual- and firm-level data over three years. The paper found that the returns on human capital were around 10 percent using the individual data, but for the firm level the returns were much lower (8 percent). With regards to the returns on physical capital, the returns were much higher than from human capital. The authors concluded that the cause for the failure of a successful manufacturing sector was the high cost of capital and not the lack of skills.

Sabir and Aftab (2006) investigated the return to human capital in Pakistan at a provincial level and tried to untangle the relative effects of education and experience. The paper used the Labour Force Survey of 1990 to 1991 and employed the Mincer (1974a) wage equation. The paper found that both education and experience were positive indicating that if an individual had no schooling and no experience it would hinder his/her career movements.

From another African perspective, Nordman and Roubaud (2009) investigated the gender wage gap in Madagascar in 1998 and determined the return to experience. The paper used the National Institute of Statistics (INSTAT), sampling 2 403 individuals, and found that the return to actual experience decreased for women and increased for men. This indicated that potential experience is overestimated for women.

3.3.3 South African studies using the Mincer equation:

The Mincer wage equation has been used in a number of international labour studies but only a small number of South African papers have used the equation. Schultz and Mwabu (1996) investigated pre-1994 data, using the 1993 Project for Statistics on Living Standards and Development (PSLSD) with a sample size of 43 974, in order to determine if the education

Africans received distorted their marginal wage and affected future levels as the supply of educated Africans increased. The study found that private wage returns, for Africans, were twice as high as Whites in 1993. In addition, ability and higher education were complements for whites as the returns to higher education increased significantly, from 9 percent to 18 percent. In a follow up study, Schultz and Mwabu (1998) quantified the impact South African unions had on the distribution of economic welfare using the 1993 population data collected by the South African Labour and Development Research Unit (SALDRU). The sample size was 653. The study concluded that union membership increased the wages of African workers quite substantially (145 percent) whereas for white workers, union premiums were quite low (21 percent). The authors explained that while the wages of Africans increased from a low income bracket to a higher income bracket, Whites remained within the high income bracket. Schultz and Mwabu (2000) continued their work from 1996 by determining the wage premiums associated with educational investments and how wages vary between race and gender. The authors used the same data from the 1996 study and had a sample size of 25 569. Since many Africans sampled in the study did not have a high level of education, those who had primary, secondary or tertiary education had higher returns than any other race. The study found that the returns to education increased with the level of education (which is in line with similar research) and decreased with the average educational attainment of the race and gender group. Therefore, the returns to higher education for Whites decreased as many Whites had a higher education. The paper suggested increasing the admission requirements for higher education so that there is a reduction in whites who attain a higher education and the average wage return for Matriculants would increase. For Africans, more education and more Africans attaining a higher education will lead to an increase in education quality or an increase in any additional marketable skills.

Bhorat (2000) investigated wage trends in South Africa using the 1995 October Household Survey and investigated wage trends from various aspects, including the gender wage gap and race wage gap. The author estimated two models, one for skilled workers and another for unskilled workers, to explain the role of wages in a skills-constrained high- skilled labour growth economy. The paper found a strong race wage gap, and education and experience had differing effects on wages for skilled and unskilled labour (although both were positive effects). With regards to the sectors Bhorat (2000) found that workers earned the lowest wages in the agricultural sector and the highest wages were earned in the financial services sector (Table 1 provides the results).

Table 1: Inequality measures for log of wages, by main sector, South Africa

Sector	90 – 10	75 – 50	50 – 10	90 -50	50 – 25	75 – 25	Gini
Agriculture	3.04	2.42	2.37	1.6	2.13	2.6	0.79
Mining	3.7	3.15	2.87	3.63	2.7	3.28	0.47
Manufacturing	3.69	3.15	2.95	3.6	2.7	3.28	0.56
Electricity	3.79	3.33	3.21	3.66	3.05	3.51	0.41
Construction	3.79	3.2	2.88	3.73	2.6	3.3	0.63
Wholesale	3.7	3.1	2.96	3.61	2.74	3.26	0.67
Transport	3.71	3.26	3.11	3.58	2.93	3.43	0.5
Financial Services	3.92	3.34	3.18	3.84	2.95	3.49	0.54
Community Services	3.64	3.15	3.11	3.49	2.99	3.38	0.51

Source: Bhorat, 2000

Keswell and Poswell (2004) applied the Mincer (1974a) equation to determine the returns to education in South African using the World Bank's Project for Statistics Living Standards and Development (PSLSD), the October Household Survey (OHS) and the Labour Force Survey (LFS) for 1993, 1995, 1997 and 2000. The paper found a strong convex relationship between wages and education implying that the returns to education increased as education increased.

Lakay (2007) used the Mincer equation (Mincer and Polachek, 1974) to determine the public-private sector wage gap. The paper was different from other studies as it switched from the OLS to FIML to reduce selection bias and endogeneity. The paper employed the 2002 Labour Force Survey, which had a sample size of 7 681 individuals. The paper found that females, who were members of a trade union, were less likely to be employed in the public sector than men, who had union membership. Individuals with a higher level of work experience were more likely to be employed in the public sector. In addition, the paper found that the wage differential between the public and private sector was positive and high.

In order to examine the determinants of the reservation wage in Khayelitsha/Mitchell's Plain; Walker (2003) used data from the Khayelitsha/Mitchell's Plain survey of 1905 households. The study was completely different from previous work as no other South African study had used the Mincer equation to investigate reservation wages in an informal settlement. The study found that the labour market status had a strong influence on reservation wages. Unemployed individuals reported a reservation wage that was far below what they could expect to earn, as their reservation wage was influenced by subsistence requirements.

3.4 Conclusion:

The section has demonstrated that there is an ongoing academic interest in the relationship between wages, education and experience. The Mincer (1974a) wage equation is still used extensively to determine the return to human capital and is still relevant to use as long the environment is stable. Furthermore, there are positive and increasing returns to education and experience. Therefore, this paper will use the Mincer wage equation to determine if the minimum wage, aided by ESTA, restructured the agricultural labour force and, if so, how.

4. DATA AND METHODOLOGY

This section provides the data used, and discusses the empirical Mincer model equation and the method of analysis used in the paper.

4.1 Data:

The model is estimated using the Post Apartheid Labour Market Series 1994 to 2012 (PALMS) dataset, version 2 (DataFirst, 2013). PALMS appends the October Household Survey (OHS) from 1994 to 1999, the Labour Force Survey (LFS) from 2000 to 2007, and the Quarterly Labour Force Survey (QLFS) from 2008 to the first quarter of 2012. The data for the OHS, LFS and QLFS was collected by Statistics South Africa. The three datasets are household surveys with the OHS being collected on an annual basis, the LFS collected bi-annually and the QLFS collected quarterly. Due to data limitations the paper will only focus on the introduction of the minimum wage in 2003 and will not include the increase that occurred in 2013. The sample is restricted to African unskilled workers and who reside in the Western Cape, Eastern Cape, Free State, KwaZulu-Natal, Mpumalanga and Limpopo in South Africa and provides a sample of 59 660 for farm workers and 145 897 for the control group (the total sample size is 2 200 272). The period of observation is 1994 to 2011. Table 2 shows the number of farm workers per province. All the provinces included in the sample[7] have the highest number of farm workers in the country.

Table 2: Number of unskilled workers, by farm workers and the control group, 1994-2011

Province	Control group	Farm workers	Total
Western Cape	20 850	17 224	38 074
Eastern Cape	15 760	5 643	21 403
Northern Cape	7 783	7 289	15 072
Free State	12 269	5 575	17 844
KwaZulu-Natal	24 905	8 964	33 869
North West	12 015	3 282	15 297
Gauteng	24 642	1 237	25 879
Mpumalanga	14 303	5 471	19 774
Limpopo	13 370	4 975	18 345
			-
Total	145 897	59 660	205 557

Source: DataFirst, 2013

[7] The Northern Cape, Gauteng and North West were included in Table 2 to indicate the number of unskilled workers in the provinces. As previously stated (in the Introduction) these provinces were excluded from the sample as these provinces had the least amount of agricultural households.

Since three different household surveys are combined four problems arise. The first is the combined variable for years of schooling is only from 0 to 16 years whereas years of schooling in each individual dataset are from 0 to 20 or 25 years (depending on the level of education). No explanation is provided as to why the combined years of schooling variable was smaller than the unmerged individual variable. A new schooling variable was created, *school1*, which corrected for the error by creating a separate year for each level of schooling. Secondly, there was no categorical variable describing unskilled labour. In order to overcome this, the industry and occupation codes were used to identify farm workers and unskilled labour. In Pauw (2007) and Bhorat, Kanbur and Stanwix (2012) the process was to cross tabulate industry and occupation to identify the unskilled workers. In the occupation variable, elementary workers are considered unskilled labour. Thirdly, the data does not capture the non-monetary income received. Hall, Kleinbooi and Mvambo (2001) and Bhorat, Kanbur and Stanwix (2012) state that farm workers receive substantial in-kind income such as: free housing, utilities and transport. Hence, the fact that some farm workers receive non-cash income may be a possible reason as to why farm workers earn a lower wage than other primary sector workers (Bhorat, 2000). However Hall, Kleinbooi and Mvambo (2001) state that farm workers earn a lower income as they have less education than other unskilled workers.

The last and most important data problem that arises is wages. According to Wittenberg (2014) there are various differences among the household surveys, key of which, is the wage data. In the OHS two questions were posed to individuals: the earnings of employees and the earnings of employers or self-employed individuals. In the LFS, the two questions were merged into one. Later, the QLFS reintroduced the two question format but ensured that individuals could only answer one of the questions. Therefore, the decline in earnings from 1999 to 2001 might be due to the discontinuity of the questions. Similarly, the increase in earnings from 2007 might be due to the change over from the LFS to the QLFS. In addition to the wage question asked by field workers, each household survey had further wage related problems. For the OHS, Heap (2008) found the 1995 OHS data to be anomalous and completely discarded it. Furthermore, fieldworkers were incentivised to seek out self-employed individuals for the 2001 LFS, resulting in more informal workers being included in the data than normal. Another problem was that the QLFS did not provide any wage data until quarter four in 2009, leading to wage data having to be calculated by DataFirst.

The wage data is available in both nominal and real terms and this paper will use real monthly wages. In order to convert the income variable into real values, the Consumer Price Index at constant 2000 prices was used leading to a deflation of the variable (Wittenberg, 2014). Based on the above, there should be some anomalies in the wage data, which cannot be rectified. Figure 4 provides the real monthly wage figures for the South African labour force. Wages are extremely high in 2000, 2005 and 2010, which may be the anomalies discussed above. Furthermore, no income information is available for 1996, 2008 and 2009.

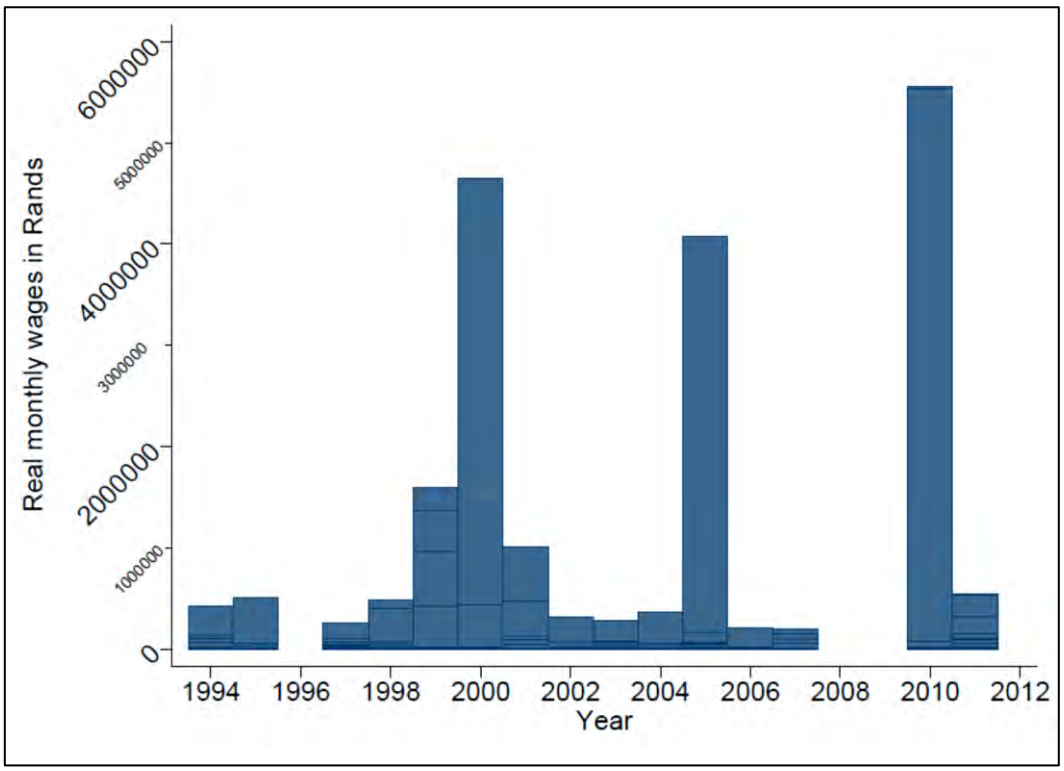

Figure 4: Real monthly wages of the South African labour force
Source: DataFirst, 2013

4.2 Variables estimated:

The variables used in the model are: natural logarithm of wages (*ln_wages*), years of schooling (*education*), *experience*, *experience*^{2}, *male* and dummy variables for race (*White*, *Coloured* and *Asian*). The natural logarithm of earnings (*ln_wages*) is used since it allows the human capital investment variables (education and experience) to be expressed as units of time (normally in years) whereas if the absolute of earnings is used, the human capital investment variables have to be expressed as monetary units (dollars and so on) (Mincer, 1974a).

Education is the main variable of interest in any Mincer (1974a) equation and is included in the model as *education*, which provides the years of schooling attained. According to the literature review individuals with a higher education levels earn higher income, which is an expected outcome of this model.

With regards to *experience*, age will be used as a proxy for *experience* (Keswell and Poswell, 2004). Many studies calculate experience as age minus years of schooling minus six (Light and Uretha, 1995; Bhorat, 2000; Feliciano, 2001) however, this may lead to an overestimation of experience (Lakay, 2007). Mincer (1974a) states that earnings increases as the number of years of schooling increases but also as age (used as a proxy for education) increases (only during the working life). However, the paper also found that the relative rate of increases in earnings starts to diminish with age and may even become negative during the last decade of the working life. This implies that investment in education is highest at younger ages and then diminishes with age, as there is less education attained as one becomes older. Hence, $experience^2$ is included to show the decline in income that will occur closer to the retirement age.

Male is also included in the model as it provides an insight into gender discrimination that occurs in wage rates. Asher and Asher (1990) state that men earn more on average, as men have more work experience and education. This is a similar case in South African agriculture where men earn more than women as they are stronger and work longer hours (Conradie, 2003; Kritzinger and Vorster, 1996).

Race is included for the same reasons as *male*, to determine if race discrimination occurs in wage rates. Many South African studies have found that race discrimination does occur (Walker, 2003; Lakay, 2007) but these studies were not conducted in agriculture.

4.3 Empirical model:

The studies in the Mincer equation section mostly followed a similar wage equation, based on Mincer (1974a).

$$\text{Ln (wages)} = \alpha_0 + \alpha_1 \text{ education} + \alpha_2 \text{ experience} + \alpha_3 \text{ experience}^2 + \alpha_4 \text{ male D} + \alpha_5 \text{ White D} + \alpha_6 \text{ Coloured D} + \alpha_7 \text{ Asian D} + \varepsilon \quad \text{(Equation 2)}$$

Where:

α_0 is the intercept;

α_i are the coefficients;

ε is the error term;

Ln (wages) is the logarithm of real hourly wages in Rands;

Male is a dummy variable where 1 is male and 0 is female

Education is years of schooling with 0 being no schooling, 1 being pre-school, and so on;

Experience is proxied by age (Keswell and Poswell, 2004), since Lakay (2007) notes that using experience as age minus years of schooling minus six leads to overestimation;

White is a dummy variable where 1 is White and 0 is other;

Coloured is a dummy variable where 1 is Coloured and 0 is other; and

Asian is a dummy variable where 1 is Asian and 0 is other

The paper runs a pooled Ordinary Least Squares (OLS) regression analysis to show the cross-sectional effect of the independent variables on the log of hourly wages. A pooled-cross sectional is estimated since the data covers three datasets that are pooled together (Wooldridge, 2009). The dataset used is PALMS and pools together the October Household Survey (OHS), the Labour Force Survey (LFS), and the Quarterly Labour Force Survey (QLFS). In addition, two groups will be estimated. The first is unskilled farm workers in the Western Cape, Eastern Cape, Free State, KwaZulu-Natal, Mpumalanga and Limpopo, who are the main interest group, and the second group is unskilled workers in the same provinces (the *control group*). This second group consists of mining and quarrying, manufacturing, trade, transport, utilities, construction, services, finance and domestic services sectors. The control group is included in order to determine if the minimum wage did affect the return to skills of farm workers or if there were other factors (economic or political). The model discussed above will be applied to both groups and over three periods: before the introduction of ESTA (1994 to 1996); between the introduction of ESTA and before the introduction of the minimum wage (1997 to 2002); and after the introduction of the minimum wage (2003 to 2011).

Using the empirical model, above, the paper seeks to find that education for all unskilled workers has increased, as access to education after 1994 would have increased, and experience will have also increased for both groups. Therefore, both the returns to education and experience are expected to increase as farmers will retain their productive labour force and reward the farm labour force accordingly. Furthermore, based on the findings of Kritzinger and Vorster (1996), returns to being male will decrease, as women will earn, at least, the minimum wage. Therefore, the return to being female will increase and there may be a decline in gender discrimination. Concerning race, Whites will continue to earn more than the other race groups, as studies (Walker, 2003; Lakay, 2007) have found that race discrimination is prevalent. This study expects race discrimination to be present in agriculture.

5. RESULTS AND DISCUSSION

The key question to be considered is whether and how the introduction of the statutory agricultural minimum wage, in 2003, affected the farm labour force. For comparison, a group of unskilled workers was defined as all unskilled workers in the following economic industries: mining and quarrying, manufacturing, utilities, transport, trade, construction, services and domestic service. In addition, a third group – general labour force – was estimated as well to determine if changes also occurred in the entire labour force. First, the descriptive statistics for the variables used in the paper will be discussed. Thereafter, the kernel distributions for the groups will be presented followed by a discussion of employment changes, changes in school and age and a discussion of the regression results. This will enable the determination of the impact that the minimum wage had on the productivity of the farm labour force. Finally, the quality of the data will be discussed.

5.1 Descriptive statistics:

Tables 3 to 5 provides the descriptive statics for farm workers and the control group (unskilled non-agricultural workers) in the Western Cape, Eastern Cape, KwaZulu-Natal, Free State, Mpumalanga and Limpopo. The sample size is 59 660 for farm workers and 145 897 for the control group over the period 1994 to 2011.

Table 3: Unskilled workers per industry

Industry	Occupation: Elementary
Agriculture, hunting, forestry and fishing	59 660
Mining and quarrying	4 811
Manufacturing	20 612
Utilities	902
Construction	13 729
Trade	52 774
Transport	5 897
Finance	10 530
Services	26 536
Domestic Services	10 106
Total	205 557

Source: DataFirst, 2013

As mentioned in Section 4, unskilled workers in the PALMS dataset are found in the occupation variable as elementary workers. Unskilled workers were mostly in the agriculture, hunting, forestry and fishing industry and the trade industry. Table 3 also shows that there

was a small portion of unskilled mining workers within the dataset and may be due to the OHS, LFS and QLFS surveys not covering mining locations adequately. It seems that the surveys did not cover areas where most unskilled workers were located as the portion of the sample size that is unskilled is only 9.34 percent.

Table 4: Descriptive statistics for farm workers and control group

	Farm workers		Control		ANOVA
Variables	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**	
Male (1=male; 0=female)	0.62	0.49	0.53	0.5	1 089.25*
Experience	35.72	11.74	38.23	11.51	1 530.00*
Education	6.45	4.05	8.93	4.15	10 619.17*
Hours worked	47.9	12.94	43.06	16.67	3135.44*
Nominal wages	840.23	2 421.98	1 776.64	11 238.40	238.29*
Real wages	665.99	1 513.1	1 283.96	11 064.95	108.82*
No schooling	0.18	0.39	0.09	0.28	3139.95*
Primary (1996 onwards)	0.48	0.5	0.31	0.47	3 998.53*
Primary (1994 and 1995)	0.10	0.29	0.05	0.21	1 486.65*
Secondary	0.26	0.44	0.40	0.49	2 875.93*
Matric	0.05	0.21	0.15	0.36	3 771.70*
Degree	4.81E-04	0.02	1.25E-03	0.04	19.27*
Postgraduate	2.30E-04	0.02	5.69E-04	0.02	7.87*
Real weekly wages	189.15	504.67	375.48	3 516.72	34.28*
Real hourly wages	4.2	11.22	8.34	78.15	34.28*

Source: DataFirst, 2013

Note: * indicates that the F-test is rejected at a 5 percent level of significance.

Table 4 consists of ANOVA tables that were performed on each variable for farm workers and the control group. For each variable the F-test is rejected indicating that the variables are significantly different from each other. Since the descriptive statistics provides a snapshot of the data, it is interesting to note that there are already indicators of difference between the two groups. To begin, farm workers had 2 – 5 years less experience than the control group. The control group was also more educated as they had a mean of 9 years of schooling whereas farm workers had a mean of 6 years of schooling. Looking at the mean of each year of schooling (no schooling, primary, secondary, matric, degree and postgraduate), a majority of farm workers had primary schooling whereas the majority of the control group had secondary schooling. Furthermore, farm workers, on average, worked longer hours but this may have been the result of farm workers working longer working days due to seasonality. Farm workers also earned significantly less than the control group and this provides a good indication as to why they are described as among the poorest in the country.

It is clear that farm workers earned less cash (excluding the value of rations and housing) than any other unskilled worker in South Africa, therefore, it will be interesting to determine if after the minimum wage was introduced farm worker wages increased. Table 5 provides such insight.

Table 5: Real monthly income (Rands) for farm workers and the control group

	Farm workers			Control group			ANOVA
Year	Mean	Std. Dev	Growth rates	Mean	Std. Dev	Growth rates	
1994	567	449.29		892	1221.85		135.86*
1995	538	360.1653	-5.05	1358	1148.8	52.27	1005.36*
1996							
1997	707	856.04		1483	1702.51		159.80*
1998	706	3157.04	-0.08	1768	7115.28	19.19	12.21*
1999	797	3260.97	11.37	3302	48248.3	86.81	3.15ł
2000	628	1164.89	-26.81	2124	39025.37	-35.66	2.89ł
2001	560	457.33	-12.11	1078	1543.04	-49.26	298.77ł
2002	546	383.41	-2.57	1053	880.39	-2.34	841.88*
2003	573	364.87	4.69	995	902.38	-5.51	560.55*
2004	628	401.78	8.77	1057	1033.52	6.27	477.33*
2005	709	426.34	11.37	1031	1051.66	-2.51	253.78*
2006	716	414.79	0.90	1084	1040.22	5.15	360.27*
2007	763	571.05	6.25	1119	1044.01	3.27	299.82*
2008							
2009							
2010	854	4342.5		1411	3129.63		55.88
2011	799	1087.99	-6.81	1327	2215.46	-5.97	129.08*
Average	673	1180	-1	1405	7420	6	

Source: DataFirst, 2013

Note: * indicates significance at 5%; ł indicates significance at 10%.

Table 5 provides the ANOVA results for real monthly wages. No income information is available for 1996, 2008 and 2009 (as discussed in Section 4). Real monthly wages for the control group increased over the years at an average growth rate of 6 percent. On the other hand, the wages received by farm workers was quite erratic. Wages were constantly fluctuating and may have been a result of the type of data collected. However, it is clear that from 2002, the mean of the monthly wages for farm workers were increasing.

The descriptive statistics has brought some insight into farm workers' wages and skills. There is an indication that farm workers earned less and are less educated than the control group, although both groups consist of experienced workers. Since 2003 there has been a significant increase in the wages earned by farm workers, most likely due to the introduction of the

minimum wage, as Conradie (2003) found that there was compliance with the minimum wage legislation.

5.2 Empirical results and discussion:

The empirical results provide greater insight, by determining whether and how the introduction of the statutory agricultural minimum wage, in 2003, affected the farm labour force. The results will provide insight into three periods: before the introduction of ESTA (1994 to 1996); between ESTA and the minimum wage (1997 to 2002); and after the introduction of the minimum wage (2003 to 2011).

Kernel distributions for farm workers, the control group and the general labour were analysed to determine the impact of the introduction of ESTA and the statutory minimum wage of the logarithm of real hourly wages, education and experience, where age is used as a proxy (Keswell and Poswell, 2004; Lakay, 2007). The kernel distributions are used to determine if the distributions narrowed after the introduction of ESTA and the minimum wage, and if the distributions narrowed across wages, education and experience. Each kernel distribution was not normally distributed using the Jacque-Bera test, as the null hypothesis was rejected at a 5 percent level of significance. However, the Kolmogorov-Smirnov test performed on each kernel density indicated that distributions were unequal between all years and groups (Appendix I: Table A2). Figure 5 provides the kernel distributions of experience for the control group, farm workers, and the general labour force[8]. For the control group the experience distributions for between ESTA and the minimum wage and after the minimum wage were widening slightly, indicating that the unskilled workforce became slightly younger. The kernel distributions for farm workers showed that there was barely a discernible movement in the between and after distributions. The level of experience for farm workers has increased slightly implying that farmers choose to retain or employ farm workers who were older and had more farming experience. This fits the hypothesis that farmers have stopped hiring rather than started to retrench existing workers when the statutory minimum wage for agriculture came into effect in 2003.

Figure 6 illustrates the kernel distributions for education. In both the control and farm worker groups, there was a rightward movement of the after distribution indicating that unskilled

[8] The general labour force consists of the working age population who are employed, unemployed and currently seeking employment, as per the Statistics South Africa official unemployment status (Statistics South Africa, 2014b).

workers attained a higher education in the period after 2003, compared to the previous two periods. In contrast, while there was no movement in the after distribution of the general labour force, the density for the years of education increased. This implies that the general labour force has become more educated since 2003. Looking specifically at farm workers, the after distribution has slightly widened in comparison to the before and between distributions, indicating that while educational attainment has increased among farm workers, many farm workers still have a basic level of schooling only. Although education has increased for both groups there were still a large number of farm workers who had little – to no - education, in comparison to the control group. Therefore, education has increased in South Africa over the past 13 years but non-agricultural unskilled workers still have a higher level of education than farm workers in the provinces of interest. The difference in education levels can be attributed to challenges that rural schools face (lack of basic infrastructure, such as sanitation and water; roads; and transport, and multi-grade classrooms) (Department of Basic Education, 2012).

Figure 7 provides the kernel distributions for the logarithm of real hourly wages (ln_wages) for the control group, farm workers, and the general labour force. For the control group, a minimal movement occurs after 2003, as the after distribution maintains the same shape as the before kernel distribution and has a slight rightward movement. The slight rightward movement implies that there was a small increase in the real wages for non-agricultural unskilled workers. A very different result was seen for the farm workers. The before and between distributions remain relatively the same, whereas the after distribution has narrowed indicating that the minimum wage has caused an unprecedented narrowing of the wage distribution. The density of the after distribution has also increased showing that farm workers were earning more than before the minimum wage was implemented, however the minimum wage has now become the maximum wage[9]. Furthermore, in all three distributions, the distribution for farm workers was much narrower than the control group. This indicates that the highest paid farm worker still earns less than the highest paid unskilled worker in the non-agricultural sectors included in the study.

The kernel distributions showed that the distribution of the log of wages has narrowed, while the distributions of experience and education have kept similar distributions after the introduction of the agricultural minimum wage, for farm workers. This means that the resultant wage distribution within agriculture was affected by the introduction of the statutory

[9] This is based on the standard deviation decreasing from 1.012, after the implementation of ESTA, to 0.949, after the implementation of the minimum wage.

minimum wage rather than by a change in the underlying determinants of it (i.e. experience and education). Furthermore, due to the level of experience remaining the same for farm workers, there was no obvious effect of the minimum wage on the age structure. Therefore, farmers did discriminate against younger workers. On the other hand, education increased for farm workers, which may indicate that farmers discriminated against farm workers who were less educated. However, the same result was seen for the control group.

These findings lead to the next and main hypothesis of whether farmers are paying productive and unproductive workers equally or has the introduction of the minimum wage led to the retention of productive workers. The remainder of this section will seek to answer this hypothesis.

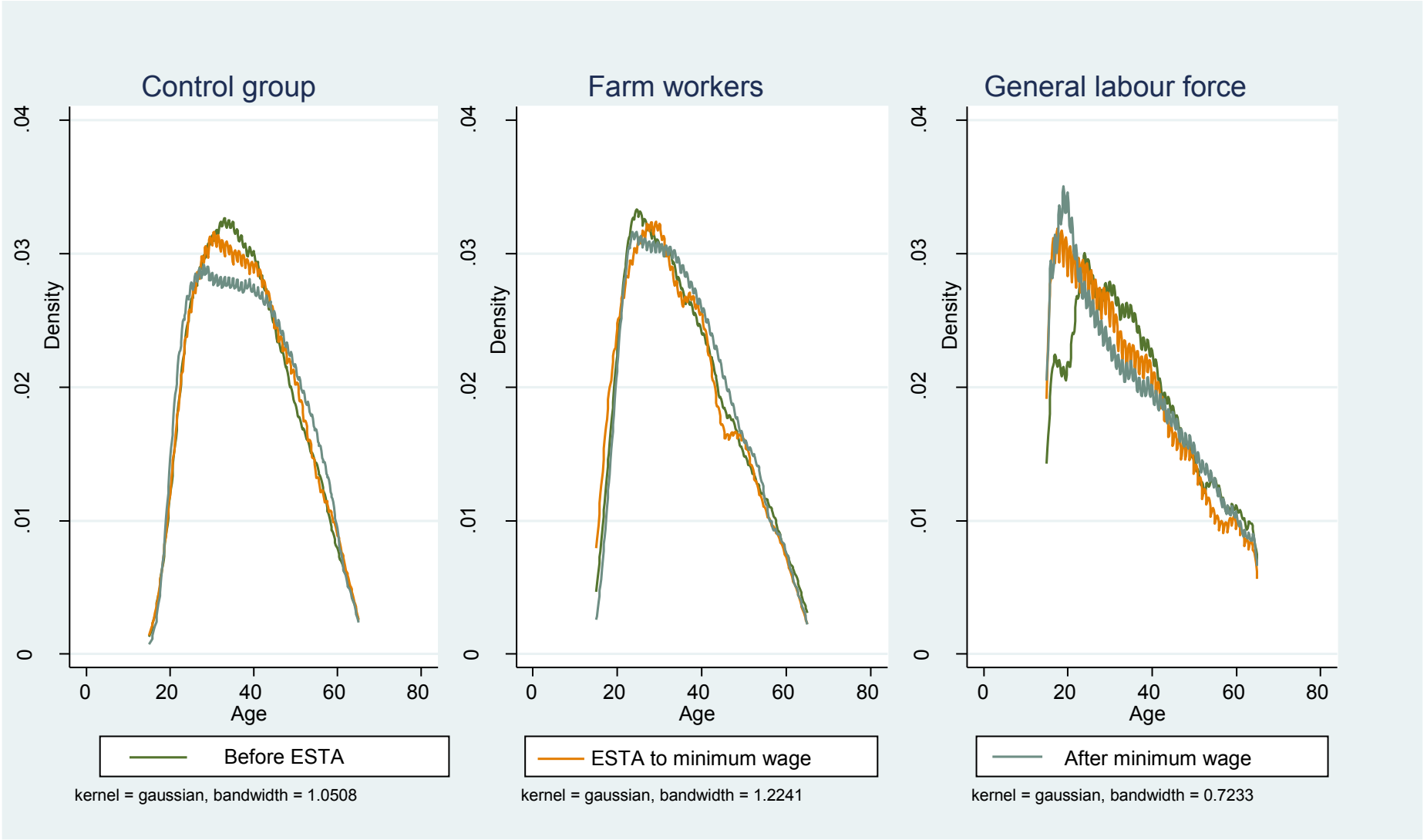

Figure 5: Kernel distributions for experience before ESTA, between ESTA and the minimum wage, and after the minimum wage
Source: DataFirst, 2013

Figure 6: Kernel distributions for education before ESTA, between ESTA and the minimum wage, and after the minimum wage
Source: DataFirst, 2013

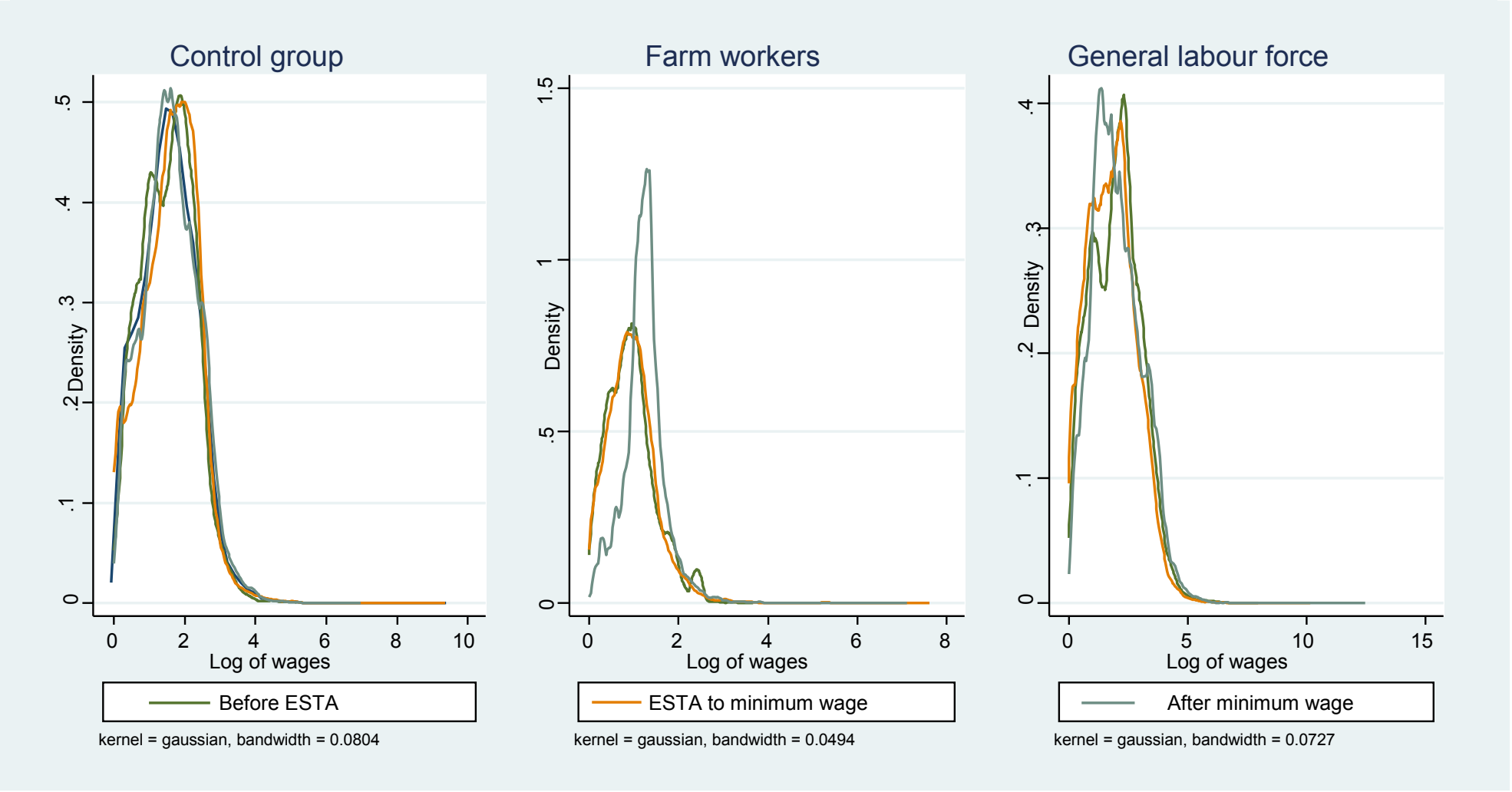

Figure 7: Kernel distributions for the logarithm of real hourly wages before ESTA, between ESTA and the minimum wage, and after the minimum wage
Source: DataFirst, 2013

Many studies (Sparrow et al, 2008; Bhorat, Kanbur and Stanwix, 2012) have stated that the introduction of ESTA and the minimum wage led to a decline in employment of farm workers, as well as increased casualisation within the farm labour force. However, little has been discussed about whether the decline in employment numbers is solely due to agricultural legislation or to business cycles. Figure 8 provides the employment figures for the general labour force along with the business cycle, using an index.

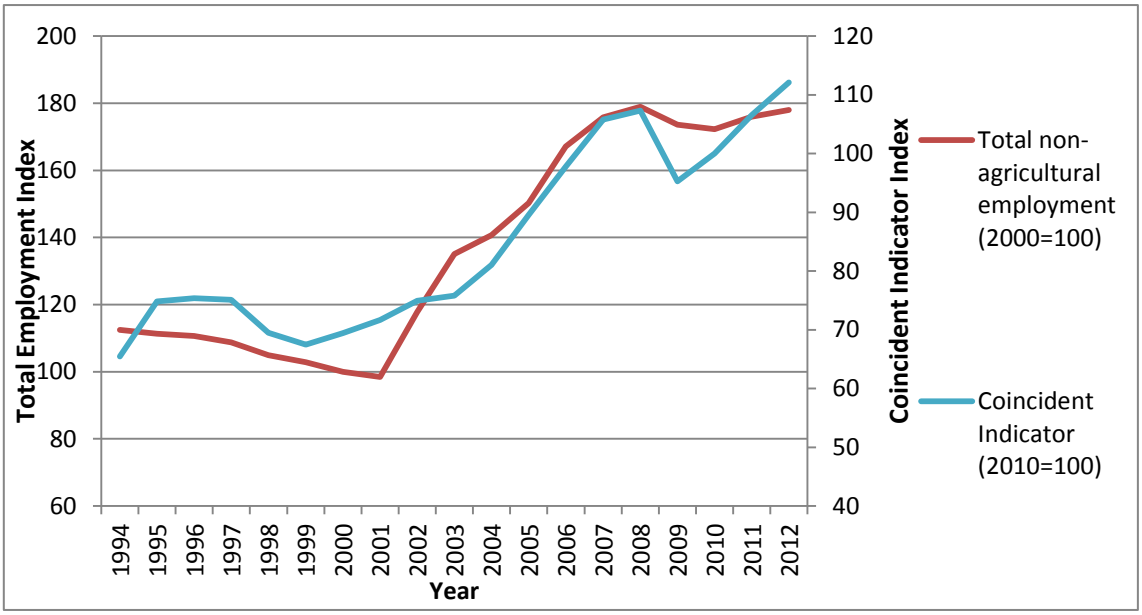

Figure 8: Total employment for non-agricultural workers and the business cycle for 1994-2012
Source: South African Reserve Bank, 2014

The Coincident Indicator is used to illustrate the business cycle for the period 1994 to 2012, as the indicator provides the current movement of the business cycle. The business cycle is plotted with the total employment for non-agricultural workers in order to determine if employment movements were related to changes in the economy. The graph indicates that employment is lagging the business cycle, which is expected. Close to 1996, the economy reached a peak and then moved towards a recession until mid-2000. Thereafter, the economy moved into an upward swing until mid-2008. Total employment decreased from 1994 to mid-2011. The increase in employment is only seen almost 3 years after the economy moved into an upward swing. Therefore, the movement in employment in South Africa is affected by the economy.

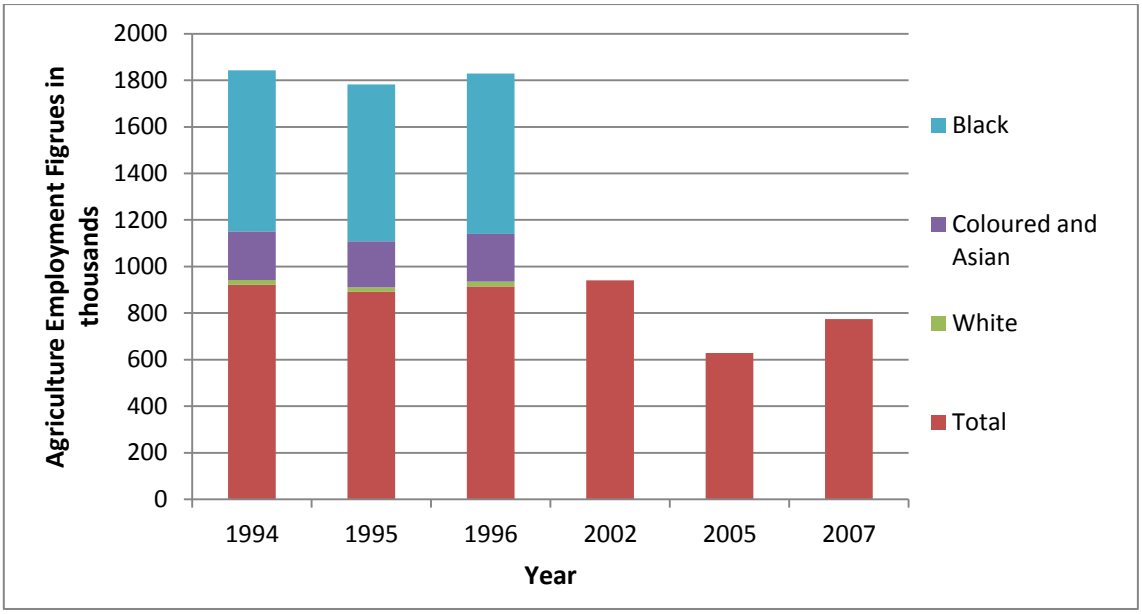

Figure 9: Employment in Agriculture, Forestry and Fishery
Source: Department of Agriculture, Forestry and Fisheries, 2013b

Since, Figure 8 clearly indicates that total non-agricultural employment is affected by the economy, it is important to determine whether employment movements in agriculture were due to agricultural legislation or solely economic conditions. Figure 9 provides the employment figures for agricultural workers in all provinces over the six years. There was a steady rise in agricultural workers between 1995 and 2002 (2.07 percentage change), which contradicts the general labour force movement. However, a drastic fall in employment between 2002 and 2005 is hypothesised to be the result of ESTA and the statutory minimum wage. The reason that this is hypothesised is due to the introduction of ESTA in 1997 and the minimum wage in 2003 and there would be an expectation of a sudden and large decrease due to farmers attempting to reduce labour costs and employ casual rather than full-time or seasonal workers. The number of agricultural workers by race is also illustrated. In all three race groups, the number of farm workers decreased, albeit by a small number, between 1994 and 1996. Based on Figure 8, the economy and employment were growing between 2002 and 2005; therefore the decline in agricultural employment may be attributed to introduction of the minimum wage in 2003.

Hence, the minimum wage reduced employment of farm workers, however it is still unclear how ESTA and the minimum wage affected the level of education and experience, in order to determine if there was an impact on the productivity of the labour force. ANOVA tables are, therefore, used to determine the relationship between casualisation, education, experience, and real monthly wages. ANOVA tables are favoured as it measures how much of the

variability in the y-variable is explained or not explained by the x-variable (Wooldridge, 2009). Table 6 provides the ANOVA results for each variable and for farm workers, the control group, and the general labour force for before ESTA, between ESTA and the minimum wage, and after the minimum wage.

Table 6: Evidence of kernel distribution findings for farm workers, the control group and the general labour force

	Before ESTA	Between ESTA and the minimum wage	After the minimum wage	ANOVA[1]	ANOVA[2]	Before ESTA	Between ESTA and the minimum wage	After the minimum wage
Farm workers					**Unskilled**			
Casualisation[10]	47.31	49.65	47.32	148.43*	Casualisation	626.93*	425.39*	1863.90*
Education	5.63	5.98	6.8	308.74*	Education	1042.83*	2445.88*	6615.40*
Experience	35.6	34.91	36.05	41.78*	Experience	140.02*	644.47*	708.67*
Wage (R/month)	552.83	617.02	716.28	29.35*	Wage (R/month)	869.21*	18.13*	905.87*
Control group								
Casualisation	42.09	45.69	42.60	268.96*				
Education	8.20	8.39	9.10	318.96*				
Experience	38.00	38.34	38.20	2.31ł				
Wage (R/month)[11]	1122.35	1568.94	1205.20	5.91*				
General labour force								
Casualisation	21.07	45.82	43.42	75880.89*				
Education	9.51	9.27	9.97	3005.96*				
Experience	35.79	34.03	34.47	755.24*				
Wage (R/month)	2152.67	2199.34	2445.91	5.1ł				

Source: Author's own calculations using PALMS (DataFirst, 2013)

Note: ANOVA[1] indicates the F-statistic from the ANOVA tables; ANOVA[2] indicates the F-statistic from the ANOVA table measuring the variability between farm workers and the control group.

[10] Casualisation is measured using the number of hours worked in the past 7 days. If a decrease in hours worked is experienced between the periods of interest, then it is assumed that casualisation occurred. Casualisation refers to the movement from permanent and seasonal workers to casual workers to save on labour costs (Sparrow et al, 2008).

[11] Wage refers to real monthly wages at constant 2000 figures.

With the introduction of the agricultural legislation (ESTA and the minimum wage), it can be reasonably hypothesised that farm owners would choose to employ casual workers instead of full-time or seasonal workers (Sparrow et al, 2008). According to Table 6, the mean hours worked per the past 7 days increased significantly during the before and between period, and then declined significantly during the between and after period. There is some indication that casualisation occurred after 2003. However, this evidence of casualisation applies as much to the control group of unskilled workers and general labour force as to the treatment group of unskilled agricultural workers. Therefore, the data on casualisation from Table 6 does not support the idea that the introduction of the statutory minimum wage for agriculture, in particular, lead to casualisation of the farm work force as Du Toit and Ally (2003) concluded, but that instead it was caused by more general factors in the economy as Barrientos and Kritzinger (2004) hypothesised. Furthermore, Table 6 presents evidence of a greater degree of casualisation in the rest of the economy than in agriculture. If a 45 hour work week is taken as full employment, agricultural workers on average were employed 107 percent fulltime, which is not implausible given the seasonal nature of farm work. In the period after 2003 this had declined to 105 percent. The corresponding figures for the control group are 97 percent on average and 95 percent after 2003. These figures suggest that the main effect of the introduction of a statutory minimum wage has not been to reduce the hours worked for farm workers.

This is not to say, however, that the rise in the cash wage did not cause a substitution of cash for non-cash benefits, as Conradie (2005) had found or a loss of job security for casual workers as many commentators expect. The bad news for all unskilled workers is that the economic forces that drive casualisation are here to stay and that over time the hours workers work will decline. The good news for farm workers is that this sector is experiencing a smaller degree of casualisation than comparable sectors in the rest of the economy. Although the remaining employment in agriculture is increasingly less secure, there is still a lot of job security in the country as a whole.

Table 6 also provides the mean education for farm workers, the control group, and the general labour force. For all three groups, the level of education increased significantly from 1994 to 2011. Education in the general labour force increased marginally whereas education in both unskilled groups increased substantially. Farm workers experienced a percentage increase of 13.71 percent from the between period to the after period, whereas the control group only experienced a percentage change of 8.02 percent. Therefore, farm workers are

gaining more access to education and becoming more educated. However, even though farm workers are becoming more educated, their level of education is still well below that of the control group and the general labour force.

Experience, proxied by age, was also increasing significantly for farm workers after 2003, whereas experience has remained relatively constant for both the control group and the general labour force. Experience for farm workers declined slightly after the implementation of ESTA, but then experienced a percentage change increase of 3.27 after 2003. For the control group, experience increased after 1997 but did not increase any further. The general labour force has maintained an average age of 35 years, which is still lower than the unskilled groups. Therefore, farmers are choosing to retain workers who are more experienced, leading to a discrimination against the youth. Similarly, the same result is found for the control group. The lack of the youth[12] being employed is worrying in a country that has a high rate of youth unemployment (Statistics South Africa, 2014b).

ANOVA[2] provides the F-test for joint significant between unskilled workers (agricultural and non-agricultural) for casualisation, education, experience, and real monthly wages. For all variables, joint significance is rejected at a 5 percent level of significance indicating that there were no similarities within the variables for agricultural and non-agricultural workers.

Therefore, farmers are discriminating against uneducated and young workers, preferring to employ farm workers who are educated and more experienced. The paper hypothesises that since farmers have an affinity to more skilled workers, the returns to skills should be higher than before 2003. In order to determine if farm workers are rewarded accordingly, the regression results from Mincer wage equations will be analysed.

[12] Youth employment are those who are 15 to 34 years old (Statistics South Africa, 2014b).

Table 7: An OLS model of the log of monthly real wages

	Farm workers			Control group			General labour force		
Variables	**Before ESTA**	**Between ESTA and the minimum wage**	**After the minimum wage**	**Before ESTA**	**Between ESTA and the minimum wage**	**After the minimum wage**	**Before ESTA**	**Between ESTA and the minimum wage**	**After the minimum wage**
Education	0.021 (0.002)*	0.024 (0.002)*	0.029 (0.001)*	0.037 (0.003)*	0.035 (0.002)*	0.046 (0.001)*	0.086 0	0.094 (0.001)*	0.104 0
Experience	0.036 (0.004)*	0.031 (0.003)*	0.026 (0.002)*	0.053 (0.007)*	0.061 -0.004	0.035 (0.002)*	0.079 (0.003)*	0.087 (0.002)*	0.05 (0.001)*
Experience2	-3.8E-04 (5.44E-05)*	-3.12E-04 (3.55E-05)*	-2.65E-04 (2.29E-05)*	-5.34E-04 (8.65E-05)*	-5.59E-04 (4.79E-05)*	-2.74E-04 (2.68E-05)*	-7.87E04 (3.73E-05)*	-8.52E-04 (1.98E-05)*	-4.12E-04 (1.28E-05)*
Male (1=male; 0=female)	0.153 (0.019)*	0.134 (0.01)*	0.122 (0.006)*	0.446 (0.024)*	0.412 (0.013)*	0.268 (0.008)*	0.36 (0.01)*	0.45 (0.005)*	0.379 (0.003)*
White D	0.545 (0.212)ł	1.475 (0.19)*	1.289 (0.130)*	0.637 (0.092)*	0.865 (0.081)*	1.024 (0.039)*	0.731 (0.016)*	0.851 (0.011)*	0.851 (-0.007)*
Coloured D	0.263 (0.018)*	0.344 (0.01)*	0.275 (0.006)*	0.093 (0.028)*	0.453 (0.016)*	0.343 (0.009)*	0.115 (0.011)*	0.281 (0.006)*	0.277 (-0.004)*
Asian D	0.27 (0.122)*	1.47 (0.416)*	0.526 (0.152)*	0.529 (0.066)*	0.444 (0.042)*	0.56 (0.034)*	0.468 (0.02)*	0.57 (0.013)*	0.631* (0.009)*
Hours worked	-0.004	-0.001	0.001	0.004	0.002	0.007	1.72E-04	4.05E-04	2.96E-04

	(0.001)*	(4.59E-04)*	(3.19E-04)*	(0.001)*	(4.15E-04)*	(2.45E-04)*	(4.68E-04)*	(1.70E-04)	(1.21E-04)*
Constant	0.114 -0.087	0.005 (0.057)ł	0.26 (0.036)*	-3.523 (0.139)*	-0.553 (0.078)*	-0.267 (0.044)*	-1.113 (0.06)*	-1.521 (0.031)*	-0.97 (0.02)*
Adjusted R^2	0.1084	0.1779	0.1761	0.2247	0.1809	0.1597	0.473	0.4365	0.452
Number of observations	3877	10374	20304	3046	12639	38933	22354	88889	217463
F-statistic	10.80*	4.17*	1.22	4.31*	36.11*	25.36*	3.87*	19.27*	2279.89*

Source: Author's own calculations using PALMS (DataFirst, 2013)

Note: Dependent variable is logarithm of real hourly wages. *** indicates significance at 0.1%; ** indicates significance at 1%; * indicates significance at 5%; ł indicates significance at 10%. Figures in brackets are standard errors.

Table 8: Gender wage differential for farm workers, control group and general labour force

	Farm workers			**Control group**			**General labour force**		
Gender	**Before ESTA**	**Between ESTA and minimum wage**	**After minimum wage**	**Before ESTA**	**Between ESTA and the minimum wage**	**After minimum wage**	**Before ESTA**	**Between ESTA and minimum wage**	**After minimum wage**
Male	563.32	660.34	744.62	1331.86	2173.86	1351.33	2561.48	2638.11	2824.21
Female	525.3	550.48	670.79	868.99	979.33	1038.6	1526.54	1658.28	2013.33
ANOVA	7.85ł	13.57*	9.39*	127.32*	9.28*	256.43*	195.61*	26.39*	86.57*

Source: Author's own calculations using PALMS (DataFirst, 2013)

Note: *** indicates significance at 0.1%; ** indicates significance at 1%; indicates significance at 5%; ł indicates significance at 10%.

Table 7 provides the regression output for the Mincer wage equations (equation 2) where the dependent variable is the logarithm of real hourly wages. According to the table, the returns to education have been increasing for farm workers. The period between ESTA and the minimum wage showed that one extra year of schooling significantly increased wages by 2.4 percent. After the minimum wage was introduced in 2003, one extra year of schooling significantly increased wages by 2.9 percent. The same increases are seen in both the control group and the general labour force, where after 2003 one extra year of schooling significantly increased wages by 4.6 percent and 10.4 percent, respectively. Although the return to education is increasing in all three groups, farm workers still earn the least for every additional year of schooling. This may be the result of farm workers having a lower level of education than the other groups.

In contrast to education for farm workers, the returns to experience declined significantly from 1994 to 2011. After the implementation of ESTA in 1997 one extra year of experience increased wages by 3.1 percent as opposed to before ESTA, when one extra year of experience increased wages by 3.6 percent. After the introduction of the minimum wage, the returns decreased further as one extra year of experience increased wages by only 2.6 percent. For the control group and general labour force, after 1997 the returns to experience increased as one extra year of experience significantly increased wages by 6.1 percent and 8.1 percent, respectively, as opposed to between 1994 and 1997 when the return was 5.3 percent and 7.9 percent, respectively. After 2003, the return decreased as one extra year of experience significantly increased wages by only 3.5 percent for the control group and 5 percent for the general labour force.

Looking at the male variable, in the farm worker group the returns to being male decreased over 1994 to 2011. The return for the period between ESTA and the minimum wage decreased as being male significantly increased wages by 13.4 percent, whereas being male before ESTA significantly increased wages by 15.3 percent. After 2003, the return to male decreased further as being male increased wages by only 12.2 percent. The decrease in the return to gender is interesting and may be due to more women being employed in the agriculture sector or to an increase in their wages. Table 8 provides the change in wages over the three periods for men and women. In 2003, the statutory agricultural minimum wage was introduced at R69 a day and between R650 to R800 per month, depending on the area. For both men and women, real monthly wages increased although the percentage change for men was 39.18 percent and for women 27.70 percent, between 1994 and 2011. The percentage

change for female farm workers is much lower in the control group and general labour force (55.88 percent and 31.89 percent, respectively). Therefore, it seems that the lower return to men relative to women after the minimum wage is due to more women being employed in the farm worker labour force. Similar to farm workers, the return to male decreased for the control group over the period of interest. Before ESTA, being male increased wages by 44.6 percent, while between ESTA and the minimum wage being male increased wages by 41.2 percent. The return decreased even further as after 2003, being male increased wages by 26.8 percent. A significant decrease in the return to being male also decreased in the general labour force.

Race is also considered in the model and in all three groups Whites earn the most, relative to Africans. However, the return to being white in comparison to African increased in both the control group and the general labour force. Only in the farm labour group has there been a decrease in the return to being white relative to being African, after 2003. In terms of being coloured, all three groups show that the return to being coloured relative to African increased between ESTA and the minimum wage. However, after 2003, the return to being coloured relative to being African decreased. The return to being Asian relative to being African fluctuated for the unskilled groups, whereas a significant increase in the return occurred in the general labour force. The return to being Coloured relative to being African is quite interesting as one would assume that many farm workers, especially in the Western Cape, would be Coloured. However, in order to determine why there is a change in returns, race distributions in each province of interest, along with determining if the province has more labour intensive activities will have be to examined. Due to the lack of data, this is beyond the scope of the paper.

In terms of the return to hours worked, there is clear negative return for farm workers. Between ESTA and the minimum wage, one extra hour of work decreased wages by 0.1 percent in comparison to 0.4 percent before ESTA. Referring back to Table 3, during this period the number of hours worked by farm workers increased. Therefore, as farm workers work more hours they are rewarded accordingly. In comparison to the control group, the return to hours worked remained positive but decreased as one extra hour worked increased wages by 0.2 percent as opposed to 0.4 before ESTA. After 2003, the return increased for the control group as one extra hour worked increased wages by 0.7 percent and during this period the number of hours worked decreased. It seems that non-agricultural unskilled workers

earned a standard wage that is not based on the number of hours worked, since if fewer hours are worked the return is higher, whereas if more hours are worked the return is lower.

The F-statistic is included to measure if education and experience are equal. In the farm worker group, education and experience are significantly different in all periods, except after the minimum wage was implemented. This is due to the coefficients of education and experience being similar. The F-statistics for the other two groups are rejected at a 5 percent level of significance, indicating their education and experience are significantly different.

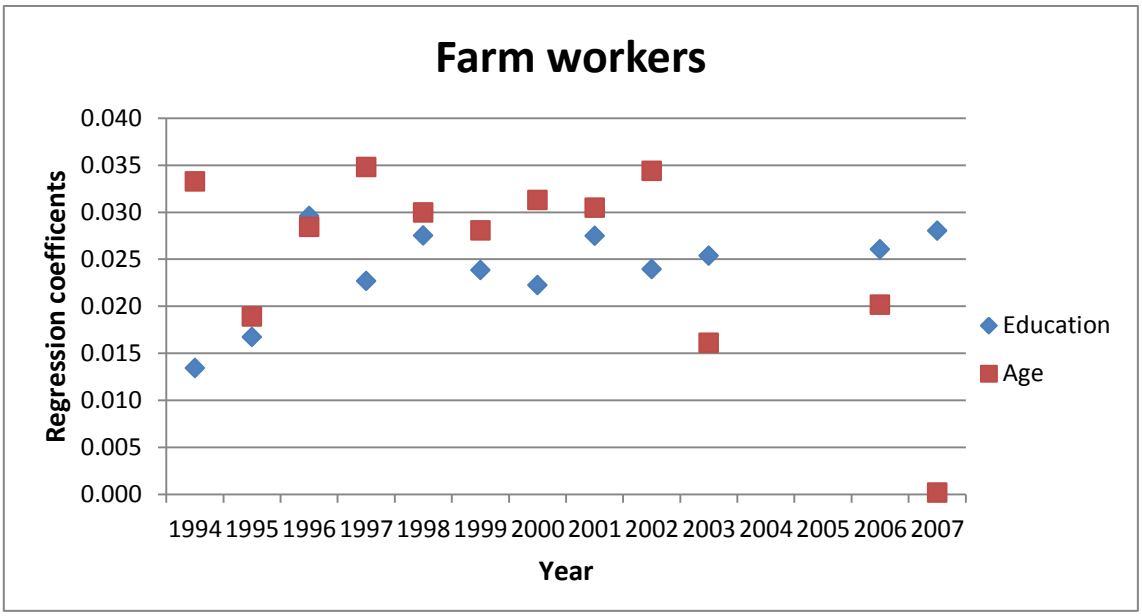

Figure 10: Yearly regression coefficients for farm workers
Source: Author's own calculations using PALMS (DataFirst, 2013)
Note: Dependent variable is logarithm of wages; regression model run is Equation 2.

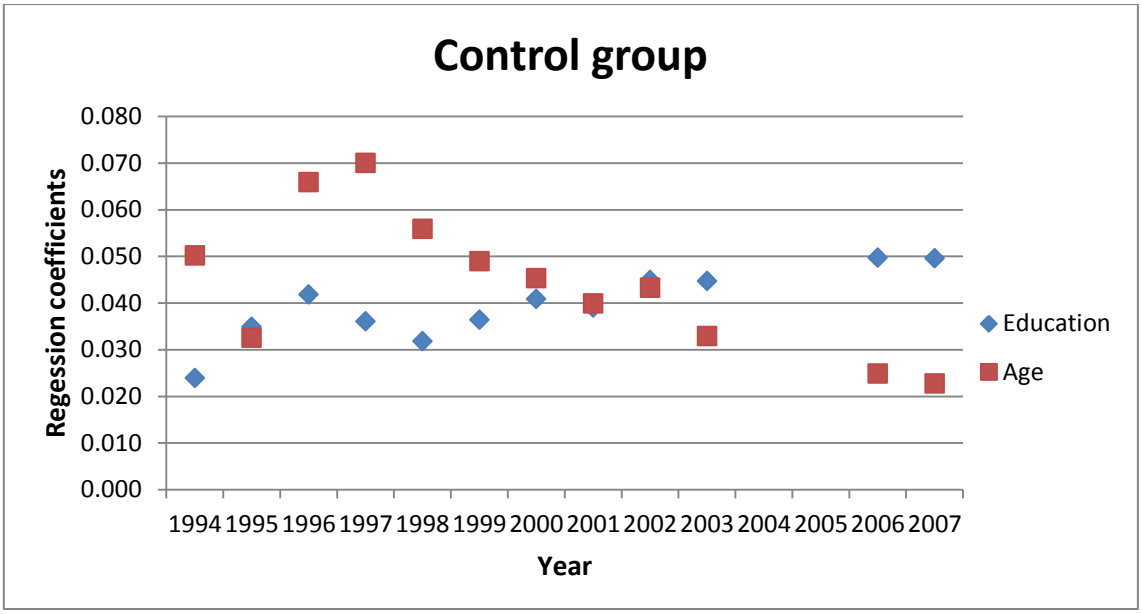

Figure 11: Yearly regression coefficients for the control group
Source: Author's own calculations using PALMS (DataFirst, 2013)
Note: Dependent variable is logarithm of wages; regression model run is Equation 2.

Figure 10 and 11 consist of the yearly regression coefficients of education and experience for farm workers and the control group. Figure 10 illustrates that education has no trend and experience has a declining trend. Figure 11 shows that education was increasing over the years, whereas experience was declining for the control group. Evidently, farmers were substituting experienced farm workers with educated workers, and preferred to pay more for a higher education.

Therefore, the results indicate no casualisation occurred after the introduction of the minimum wage, as had previously been considered. Farm workers along with other unskilled workers and the general labour force have become more educated since 1994, implying that productivity has increased (Jones, 2001). Farm workers, in particular, attained a higher level of education than before 2003 and were rewarded with higher wages. Although farm worker's level of education was still below that of non-agricultural unskilled workers. On the other hand, farmers demand an experienced workforce as well but were not willing to reward accordingly. Farmers therefore have a better skilled workforce at their disposal, after the introduction of the minimum wage in 2003. Hence, the minimum wage has restructured the agricultural labour force to be more productive. However, farm worker wages are still substantially less than the control group, even though their wages have been increasing since 2002. In addition, the increase in education and experience is a trend that is practised by other employers in both the control group and general labour force, which may imply that the

restructuring of the labour force after 2003 may be a result of general economic conditions as well.

5.3 Quality of the model:

In order to ensure that the empirical model (equation 2) was BLUE (Best Linear Unbiased Estimator), diagnostic and statistical tests were performed. These include ensuring that no heteroskedasticity existed, no serial correlation existed, and errors were normally distributed (Wooldridge, 2009). No serial correlation was found as the model is estimated using OLS and no lagged variables were used.

5.3.1 Homoskedasticity:

To test for homoskedasticity, where errors have constant variance, the Breusch Pagan test was used. The Breusch Pagan test for Heteroscedasticity determines if homoskedasticity exists by regressing the squared OLS residuals on the model's explanatory variables (Wooldridge, 2009). The null hypothesis is that error variances are all equal (variances are homoscedastic). Heteroskedasticity was found in all three periods for both farm workers and the control group and was corrected by estimating robust standard errors.

5.3.2 Multicollinearity:

Multicollinearity occurs when one or more explanatory variables are strongly correlated with one another (Wooldridge, 2009). Multicollinearity was tested for by checking the variance inflation factor (VIF), where a VIF of greater than 10 indicates a potential case of multicollinearity, across all explanatory variables. Multicollinearity was present in *experience and experience*^{2}. Furthermore, multicollinearity undermines the explanatory power of a model by increasing the standard errors, however it is reluctantly tolerated in econometric modelling as it does not violate OLS assumptions of unbiased estimators and a BLUE model.

5.3.3 Endogeneity and Normal Distribution:

OLS suffers from endogeneity as the explanatory variables are correlated with the error term. Testing for endogeneity, across the explanatory variables, was attempted but due to there being no suitable instrumental variable for *school1*, in which endogeneity may occur, the Durbin-Wu-Hausman test or similar tests could not be performed. Endogeneity was thought to occur in the education variable as educational attainment may be a result of ability. Due to data limitations, ability could not be measured. In addition, tests of normality were performed

using a standardised normal probability plot and showed that the model errors for each year was normally distributed, $N(0,\sigma^2)$ (Wooldridge, 2009).

5.3.4 Measurement error:

Measurement error is defined as the difference between the reported value and the actual value (Wooldridge, 2009). A measurement error normally occurs in survey data hence, the data may contain measurement errors, especially with regards to income as respondents may not be comfortable providing this information and income brackets may then have to be used. Another problem may be from the interviewer in that the interviewer will be inadequately trained to conduct the interview, and may have placed respondent's answers in the wrong category.

5.3.5 Robustness:

Robustness is defined as the model's ability to perform while its explanatory variables are being removed or altered (Wooldridge, 2009). The paper removed all explanatory variables, except for education and experience, and found the same result of positive returns to education and experience. Furthermore, one explanatory variable was removed at a time and the model still performed. The model for this paper is found to be robust.

6. POLICY IMPLICATIONS

Agriculture is an important sector in South Africa as it provides employment, especially to unskilled workers and can assist with reducing poverty (Thirtle, et al. 2005; Nkurunziza, 2006). However, due to an increase in labour costs, cost minimising farmers would consider mechanisation. Mechanisation options are freely available from countries that face factor ratios even less conducive to the use of manual labour than the one South Africa faces. Economic theory contends that when the factor wage increases, the use of that factor declines, usually shedding the least productive units of the input first. It implies that a number of farm workers lost their jobs due to a lack of education or experience.

The results revealed that education has increased amongst farm workers and that farm workers are being rewarded accordingly. However, farm workers still have a lower level of education than other unskilled workers and, consequently, still earn less than unskilled workers in other sectors. The problem could lie in the fact that rural schools face many challenges including being unattractive to teachers; inappropriate teaching methods, multi-grade classrooms; and a lack of basic infrastructure such as sanitation and water, roads and other transport, and electricity (Department of Basic Education, 2012). One way in which the government could improve the productivity of agricultural workers would be to improve the provinces in which most of the problems occur. Perhaps, the main challenges government should focus on is the lack of transport to rural schools and the inadequate supply of material resources (textbooks and books). This may create better-educated rural residents who have the opportunity to exit agriculture for more highly paid sectors.

The problem of youth unemployment is well documented (Mayer, 2011). The results showed that youth unemployment is prevalent in agriculture too. Farmers prefer experienced workers, between the ages of 34 to 36 years, and do not want to employ youth (between the ages of 15 to 34). Unfortunately, none of the government's many youth unemployment programmes are located in rural areas or provide any career development in agriculture. However, a programme that government can expand is the youth wage subsidy (the Employment Tax Incentive Act No. 26 of 2013). Government can assist farmers by creating a tax incentive for the employment of young farm workers. However, farmers may retrench older farm workers for the younger workers.

7. LIMITATIONS

In development economics, a number of assumptions have to be made due to the quality and availability of the data. As highlighted in Section 3, this paper is also subject to poor quality data as the PALMS dataset, which consists of labour force surveys, lacks adequate data on unskilled workers and income. Therefore, various assumptions were made in this study.

One of the crucial assumptions, which informed the analysis presented in this thesis, was that unskilled workers were a homogenous class across all sectors of the economy. This assumption made it possible to compare the marginal effect of education and experience on the hourly wage rate, from which agriculture's response to labour legislation was deduced. For example, it was argued that the return to education of farm workers had increased, although the return was still lower than non-agricultural unskilled workers. However, there is a general understanding that agricultural along with domestic work is an employer of last resort. This implies that perhaps farm workers do not have the same skills as general workers in the retail or service or construction sectors but actually bring more human capital with them that allow the average worker of other sectors to be more productive that the average worker in agriculture. To investigate whether this is the case or not, ideally one would have liked to compare the social capital, home environment and inherent motivation of workers across sectors. Unfortunately, none of these kinds of variables were available in the PALMS dataset.

The second limitation is that the PALMS dataset consists of a data problem with wages. As already stated (in Section 3), there are differing questions among the three household surveys (OHS, LFS and QLFS) creating an inconsistency among the income data collected. The differing questions mean that in the OHS and LFS individuals may have answered the wage question twice (in the case of the individual being self-employed in the OHS) and there being no differentiation between employers and employees in the LFS. This creates the problem of some employees having higher wages than the average as they were actually reporting an employer's (or self-employer's) earnings. Furthermore, in 1996, 2008 and 2009 no income data was collected. However, the lack of income data in these years had no effect on the results as only the years when the agricultural legislations were implemented were of importance. Nonetheless, income data in these years could have provided some insight especially around the time of the global financial crisis.

Lastly, the PALMS dataset does not provide an accurate picture of the number of unskilled workers in South Africa. Due to this, there may be an under-representation of farm workers and unskilled workers in certain sectors. Furthermore, information collected on these workers may be erroneous (years of schooling, age, or whether the individual is unskilled). Most worrying is whether farm workers and unskilled workers were placed in the correct group (elementary workers). Farm workers may have been erroneously placed in the "skilled agriculture" occupation group and skilled agricultural workers may have been placed in the "elementary workers" occupation group. Furthermore, this error may have occurred in the other sectors as well. This affects the analysis of unskilled workers in the country as some unskilled workers may have a higher level of education, experience or wages and may distort the unskilled labour market analysis, creating the illusion that either farm workers or unskilled workers are more educated, more experienced or earn more than they actually do. .

Going forward subsequent waves of PALMS should attempt to do the following: clearly differentiate between unskilled and skilled workers; create separate unskilled categories for each industry (for example, unskilled mining and skilled mining variables); and to survey workers in different parts of the economy, specifically in rural areas and areas not near to cities, such as mines (as the sample size of these workers is significantly smaller than other industries).

8. CONCLUSION

Minimum wages were introduced in South Africa from 1999, in the Contract Cleaning Sector. Statutory minimum wages now extend to include taxi drivers, domestic workers, retail workers, the construction sector and security guards. The statutory minimum wage for agriculture came into effect in March 2003, at the end of the summer harvest season, at a point in time when large numbers of temporary workers came to the end of their seasonal employment. Minimum wages remain a controversial topic, especially in agriculture, where the debate of whether the minimum wage promotes fair remuneration and social justice or increases unemployment continues (Bhorat and Mayet, 2013). Farm workers in South Africa are among the poorest in the country and are in dire need to improve their livelihoods. Hence, the introduction of the minimum wage was meant to reduce poverty. However, while wages increased so did unemployment as farmers could not afford the increase in wages and retain the same amount of workers. This is because farms are also businesses that have the opportunity to replace labour with machines.

This paper investigated whether the agricultural minimum wage restructured the skills profile of the agricultural labour force. This is a contribution to South African agrarian literature as no other South African study has attempted to investigate the skills (education and experience) and the returns to skills of farm workers. Furthermore, this paper makes use of a control group – non-agricultural unskilled workers – and general labour force group (all skilled and unskilled workers in the economy) in order to determine if restructuring was the result of the minimum wage or general economic or political conditions. The main findings follow.

Initially, the paper investigated if casualisation had an impact on the agriculture labour force and found that casualisation was the result of ESTA and not the agricultural minimum wage. Secondly, kernel distributions were employed to visually indicate if a narrowing of hourly wages, education and experience occurred. The kernel distributions for education and experience illustrated a widening of the distribution after the introduction of ESTA and the minimum wage, indicating that the agricultural labour force has become more educated and experienced. However, the kernel distribution for wages narrowed after the introduction of the minimum wage, which was expected, as the minimum wage would have become the wage floor. Similar results occurred for the control group and general labour force.

The Mincer wage equation was also utilised in order to determine the return to skills (education and experience). For farm workers, the return to education increased after the introduction of the minimum wage but the return to experience decreased. This led to the conclusion that farmers, while preferring a more productive labour force after the introduction of the minimum wage, prefer a more educated workforce to a more experienced workforce, as they were willing to pay more for an educated farm worker. This indicates that there was a restructuring of the agricultural labour force as the increase in labour costs led farmers to retain the most productive workers. However, similar trends were seen in the control group and general labour force, albeit not at similar margins. This, then, implies that agricultural minimum wage together with general economic conditions affected the skills requirements of farm owners for their workers.

Lastly, it should be noted that the PALMS dataset is not the best dataset to conduct such an investigation, but due to the lack of other desktop data, it is the best. The reason for PALMS being unfit is that the dataset does not include a significant sample of unskilled workers, and the wage data for some years may be erroneous. Therefore, the quality of this paper can be improved by collecting primary data on farm worker and farm productivity. This may provide a better insight into the impact of the minimum wage on restructuring the agricultural labour force.

The main contribution of this study has been providing insight into the restructuring of skills in the agricultural labour force. Of the various agricultural studies, none had investigated the impact of the agricultural minimum wage on the skills of farm workers. The study also discussed and provided policy recommendations for the poor quality of education in rural areas and prevalent youth employment in agriculture.

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APPENDIX I

Table A1: Growth rates for minimum wages since 2003 for Area A and B

	Area A		Area B	
Year	**Hourly (%)**	**Monthly (%)**	**Hourly (%)**	**Monthly (%)**
2003				
2004	9.02	8.95	9.91	9.91
2005	8.95	8.95	10.11	10.11
2006	4.72	4.68	12.66	12.66
2007	4.12	4.73	11.67	11.67
2008	5.27	4.71	10.26	10.26
2009	12.88	13.00		
2010	6.81	6.90		
2011	4.45	4.50		
2012	9.52	9.30		
2013	51.23	51.17		

Source: Author's own calculations using the minimum wage increases from the Department of Labour (2002; 2006; 2009; 2013).

Table A2: Kernel distribution diagnostic tests for all three periods

	Kolmogorov-Smirnov Test	Jacque-Bera Test	
	Combined K-S	**Pr (Skewness)**	**Pr (Kurtosis)**
Experience			
Control group	1.0000*	0.0000*	0.0000*
Farm workers	1.0000*	0.0000*	0.0000*
General labour force	1.0000*	0.0000*	0.0000*
Education			
Control group	1.0000*	0.0000*	0.0000*
Farm workers	1.0000*	0.0000*	0.0000*
General labour force	1.0000*	0.0000*	0.0000*
Log of wages			
Control group	1.000*	0.0000*	0.0000*
Farm workers	1.000*	0.0000*	0.0000*
General labour force	1.000*	0.0000*	0.0000*

Source: Author's own calculations using PALMS (DataFirst, 2013)
Note: Kolmogorov-Smirnov Test H0: Distributions are equal; Jacque-Bera Tes H0: Distributions are normally distributed; * indicates significance at 5%

The Kolmogorov-Smirnov test determines if the distributions in a kernel distribution are equal. For experience, none of the distributions were equal for any group in any of the three periods (before ESTA, between ESTA and the minimum wage, and after the minimum wage). Education and the logarithm of wages had the same results as experience. The Jacque-

Bera test is performed to determine if the distributions are normally distributed. None of the distributions were normally distributed.

APPENDIX II

STATA do file

```
clear
use "C:\Users\kavs\Documents\Masters 2013-2014\Masters Dissertation\PALMS\palms-1994-2012-data-v2.dta"

//Renaming variables//
rename yrseduc school
rename jobocccode occup
rename jobindcode indus
rename jobunion union
rename hrslstwk hours_worked
rename realearnings income

//Creating age^2 and working age population//
gen age2 = age^2
drop if age >65
drop if age <15

//Dropping missing data//
drop if educhigh1 == 22
drop if educhigh1 == 99
drop if educhigh2 == 26
drop if educhigh2 == 99

//Years of schooling//
gen no_schooling = (educhigh0==0) + (educhigh1==0) + (educhigh2==0)
gen grade0 = (educhigh0==1) + (educhigh1==1) + (educhigh2==1)
gen grade1 = (educhigh0==2) + (educhigh1==2) + (educhigh2==2)
gen grade2 = (educhigh0==3) + (educhigh1==3) + (educhigh2==3)
gen grade3 = (educhigh0==4) + (educhigh1==4) + (educhigh2==4)
gen grade4 = (educhigh0==6) + (educhigh1==5) + (educhigh2==5)
```

```
gen grade5 = (educhigh0==7) + (educhigh1==6) + (educhigh2==6)
gen grade6 = (educhigh0==8) + (educhigh1==7) + (educhigh2==7)
gen grade7 = (educhigh0==9) + (educhigh1==8) + (educhigh2==8)
gen grade8 = (educhigh0==10) + (educhigh1==9) + (educhigh2==9)
gen grade9 = (educhigh0==11) + (educhigh1==10) + (educhigh2==10)
gen grade10 = (educhigh0==12) + (educhigh1==11) + (educhigh2==11)
gen grade11 = (educhigh0==13) + (educhigh1==12) + (educhigh2==12)
gen matric = (educhigh0==14) + (educhigh1==13) + (educhigh2==13)
gen NTC1 = (educhigh0==15) + (educhigh0==18) + (educhigh1==14) + (educhigh2==14)
gen NTC2 = (educhigh0==16) + (educhigh0==19) + (educhigh1==15) + (educhigh2==15)
gen NTC3 = (educhigh0==17) + (educhigh0==20) + (educhigh1==16) + (educhigh2==16)
gen diplomalessgr12 =  (educhigh2==17) + (educhigh2==18)
gen dipless12 = (educhigh0==21) +(educhigh1==17) + (diplomalessgr12==1)
gen diplomagr12 = (educhigh2==19) + (educhigh2==20)
gen dip12 = (educhigh0==22) + (educhigh1==18) + (diplomagr12==1)
gen degree = (educhigh0==23) +(educhigh1==19) + (educhigh2==21)
gen postgrad = (educhigh0==24) + (educhigh1==20) + (educhigh2==22) + (educhigh2==23)
+ (educhigh2==24)
gen other = (educhigh0==26) + (educhigh1==21) + (educhigh2==25)
gen primary = (grade1==1) + (grade2==1) + (grade3==1) + (grade4==1) + (grade5==1) +
(grade6==1) + (grade7==1)
gen primary0 = (educhigh0==1) + (educhigh0==2) + (educhigh0==3) + (educhigh0==4) +
(educhigh0==6) +  (educhigh0==7) +  (educhigh0==8) +  (educhigh0==9)
gen secondary = (grade8==1) + (grade9==1) + (grade10==1)  + (grade11==1)

//recoded school variable//
gen school1 = .
replace school1 = 0 if no_schooling==1
replace school1 = 1 if grade0==1
replace school1 = 2 if grade1==1
replace school1 = 3 if grade2==1
replace school1 = 4 if grade3==1
replace school1 = 5 if grade4==1
replace school1 = 6 if grade5==1
```

```
replace school1 = 7 if grade6==1
replace school1 = 8 if grade7==1
replace school1 = 9 if grade8==1
replace school1 = 10 if grade9==1
replace school1 = 11 if grade10==1
replace school1 = 12 if grade11==1
replace school1 = 13 if matric==1
replace school1 = 14 if NTC1==1
replace school1 = 15 if NTC2==1
replace school1 = 16 if NTC3==1
replace school1 = 17 if diplomalessgr12==1
replace school1 = 18 if dipless12==1
replace school1 = 19 if diplomagr12==1
replace school1 = 20 if dip12==1
replace school1 = 21 if degree==1
replace school1 = 22 if postgrad==1
replace school1 = 23 if other==1

//Recoding race//
gen white = popgroup == 4
gen indian = popgroup == 3
gen coloured = popgroup == 2
gen african = popgroup == 1
recode gender(2=0)


//Creating wages//
gen wages1 = income/4 //weekly//
gen wages = wages1/45 //hourly//
gen ln_wages = log(wages)
gen ln_income = log(income)
drop if ln_wages<0

//Unskilled workers by industry//
```

```
gen unskilled_agri = (indus==1) & (occup==9)
gen unskilled_mining = (indus==2) & (occup==9)
gen unskilled_manu = (indus==3) & (occup==9)
gen unskilled_utilities = (indus==4) & (occup==9)
gen unskilled_const = (indus==5) & (occup==9)
gen unskilled_trade = (indus==6) & (occup==9)
gen unskilled_transp = (indus==7) & (occup==9)
gen unskilled_services = (indus==9) & (occup==9)
gen unskilled_dom = (indus==10) & (occup==9)
gen unskilled_finance = (indus==8) & (occup==9)

//Creating unskilled dummy variable//
gen unskilled = .
replace unskilled = 1 if indus==1 & occup==9
replace unskilled = 0 if unskilled_mining==1 | unskilled_manu==1 | unskilled_utilities==1 |
unskilled_const==1 | unskilled_trade==1 | unskilled_transp==1 | unskilled_services==1 |
unskilled_dom==1 | unskilled_finance==1

//Interaction term//
gen school_exp = school1*age

//Agriculture provinces//
gen prov = (province==1) + (province==2) + (province==4) + (province==5) +
(province==8) + (province==9) //does not include NC, GP and NW//

//Periods of interest//
gen before_after = .
replace before_after = 0 if year==1994 | year==1995 | year==1996 //Before ESTA//
replace before_after = 1 if year ==1997| year==1998 | year==1999 | year ==2000
|year==2001 | year==2002 //Between ESTA and the minimum wage
replace before_after = 2 if year==2003 | year==2004 | year == 2005 | year==2006 |
year==2007 | year==2008| year==2009| year==2010| year==2011 //After ESTA//

//General labour force dummy variable//
```

```
gen employed = empstat1==0 | empstat1==1 | empstat1==2

//separating agriculture and subsistence farmers//
tab occupation year if occupation ==9211
tab occupation1 year if occupation1 ==921
tab occupation1 year if occupation ==6210
tab occupation1 year if occupation1 ==621

//Table 1 – unskilled workers per industry//
tab indus occup if occup==9

//Quality of data//

//Robustness//
reg ln_wages school1 age age2 gender white coloured asian if unskilled==1 & prov ==1
reg ln_wages school1 age age2 gender white coloured asian if unskilled==0 & prov ==1
reg ln_wages school1 age age2 gender white coloured if unskilled==1 & prov ==1
reg ln_wages school1 age age2 gender white coloured if unskilled==0 & prov ==1
reg ln_wages school1 age age2 gender white if unskilled==1 & prov ==1
reg ln_wages school1 age age2 gender white if unskilled==0 & prov ==1
reg ln_wages school1 age age2 gender if unskilled==1 & prov ==1
reg ln_wages school1 age age2 gender if unskilled==0 & prov ==1
reg ln_wages school1 age if unskilled==1 & prov ==1
reg ln_wages school1 age age2 if unskilled==0 & prov ==1
reg ln_wages school1 age if unskilled==1 & prov ==1
reg ln_wages school1 age if unskilled==0 & prov ==1
reg ln_wages school1 if unskilled==1 & prov ==1
reg ln_wages school1 if unskilled==1 & prov ==1

//Multicollinearity//
Corr ln_wage school1 age age2 gender white coloured Asian, vif if unskilled==1
Corr ln_wage school1 age age2 gender white coloured Asian, vif if unskilled==0
```

```
//Yearly regression, Figure 7//
//Farm workers//
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 1994, robust
estat hottest //Breusch Pagan test. >0.5 do not reject H0//
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 1995, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 1996, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 1997, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 1998, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 1999, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 2000, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 2001, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 2002, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 2003, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 2004, robust
```

```
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 2005, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 2006, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 2007, robust
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 2008, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 2009, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 2010, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 1 & prov == 1 &
year == 2011, robust
estat hettest

//control group//
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 1994, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 1995, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 1996, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 1997, robust
```

```
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 1998, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 1999, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 2000, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 2001, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 2002, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 2003, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 2004, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 2005,
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 2006, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 2007, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 &
year == 2008, robust
estat hettest
```

```
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 & year == 2009, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 & year == 2010, robust
estat hettest
reg ln_wages school1 age age2 gender white coloured indian if unskilled == 0 & prov == 1 & year == 2011, robust

//new interaction term//
//In all 3 cases the interaction term is insignificant//
reg ln_wages educhigh0 age age2 gender white coloured indian school_exp if before_after==0 & prov==1 & unskilled==1, robust
estat hettest
reg ln_wages educhigh0 age age2 gender white coloured indian school_exp if before_after==1 & prov==1 & unskilled==1, robust
estat hettest
reg ln_wages educhigh1 age age2 gender white coloured indian school_exp if before_after==2 & prov==1 & unskilled==1, robust
estat hettest

// Original Kernel density test – not used//
kdensity ln_wages if occup == 9 & indus == 1 & prov == 1, kernel(gaussian) normal recast(line) addplot((kdensity ln_wages if occup == 9 & indus == 1 & prov == 1 & year == 1994) (kdensity ln_wages if indus == 1 & occup == 9 & prov == 1 & year == 1997) (kdensity ln_wages if indus == 1 & occup == 9 & prov == 1 & year == 2000) (kdensity ln_wages if indus == 1 & occup == 9 & prov == 1 & year == 2005) (kdensity ln_wages if indus == 1 & occup == 9 & prov == 1 & year == 2007)(kdensity ln_wages if indus == 1 & occup == 9 & prov == 1 & year == 2011))
ksmirnov ln_wages = (indus==1) & (occup ==9) & (prov == 1) //Kolmogorov-Smirnov test to test the equality of distributions. Look at the p-value for the last line//
sktest ln_wages if occup == 9 & indus == 1 & prov == 1 & year == 1994 //Jarque-Bera normality test H0: Normal distribution//
sktest ln_wages if occup == 9 & indus == 1 & prov == 1 & year == 1997
```

```
sktest ln_wages if occup == 9 & indus == 1 & prov == 1 & year == 2000
sktest ln_wages if occup == 9 & indus == 1 & prov == 1 & year == 2005
sktest ln_wages if occup == 9 & indus == 1 & prov == 1 & year == 2007

sktest ln_wages if occup == 9 & indus == 1 & prov == 1 & year == 2011
kdensity ln_wages if unskillnonagri == 1 & prov == 1, kernel(gaussian) normal recast(line)
addplot((kdensity ln_wages if unskillnonagri == 1 & year == 1994 & prov == 1) (kdensity
ln_wages if unskillnonagri == 1 & year == 1997 & prov == 1) (kdensity ln_wages if
unskillnonagri == 1 & year == 2000 & prov == 1) (kdensity ln_wages if unskillnonagri == 1
& year == 2005 & prov == 1) (kdensity ln_wages if unskillnonagri == 1 & year == 2007 &
prov == 1)(kdensity ln_wages if unskillnonagri == 1 & year == 2011 & prov == 1))
ksmirnov ln_wages = (unskillnonagri == 1) & (prov == 1) //Kolmogorov-Smirnov test to test
the equality of distributions. Look at the p-value for the last line//
sktest ln_wages if unskillnonagri == 1 & year == 1994 & prov == 1 //Jarque-Bera normality
test H0: Normal distribution//
sktest ln_wages if unskillnonagri == 1 & year == 1997 & prov == 1
sktest ln_wages if unskillnonagri == 1 & year == 2000 & prov == 1
sktest ln_wages if unskillnonagri == 1 & year == 2005 & prov == 1
sktest ln_wages if unskillnonagri == 1 & year == 2007 & prov == 1
sktest ln_wages if unskillnonagri == 1 & year == 2011 & prov == 1

twoway (bar earnings year if indus == 9 & occup == 1) // Lags in the wage income//

//Regression by periods – Table 5//
reg ln_wages school1 age age2 gender white coloured indian hours_worked if unskilled == 1
& prov == 1 & before_after==0, robust estat hettest
test school=age
reg ln_wages school1 age age2 gender white coloured indian hours_worked if unskilled == 1
& prov == 1 & before_after==1, robust estat hettest
test school=age
reg ln_wages school1 age age2 gender white coloured indian hours_worked if unskilled == 1
& prov == 1 & before_after==2, robust
estat hettest
test school=age
```

```
reg ln_wages school1 age age2 gender white coloured indian hours_worked if unskilled == 0
& prov == 1 & before_after==0, robust estat hettest
test school=age
reg ln_wages school1 age age2 gender white coloured indian hours_worked if unskilled == 0
& prov == 1 & before_after==1, robust
estat hettest
test school=age
reg ln_wages school1 age age2 gender white coloured indian hours_worked if unskilled == 0
& prov == 1 & before_after==2, robust
estat hettest
test school=age

reg ln_wages school1 age age2 gender white coloured indian hours_worked if employed==1
& prov == 1 & before_after==0, robust
estat hettest
test school=age
reg ln_wages school1 age age2 gender white coloured indian hours_worked if employed==1
& prov == 1 & before_after==1, robust
estat hettest
test school=age
reg ln_wages school1 age age2 gender white coloured indian hours_worked if employed==1
& prov == 1 & before_after==2, robust
estat hettest
test school=age

//Figure3 - Kernel//
kdensity ln_wages if unskilled == 0 & prov == 1, kernel(gaussian) normal recast(line)
addplot((kdensity ln_wages if unskilled == 0 & before_after == 0) (kdensity ln_wages if
unskilled == 0 & before_after==1) (kdensity ln_wages if unskilled == 0 & before_after==2))
ksmirnov ln_wages = (unskilled==0) & (prov == 1) //Kolmogorov-Smirnov test to test the
equality of distributions. Look at the p-value for the last line//
sktest ln_wages if unskilled==0 & prov == 1
```

```
kdensity ln_wages if unskilled == 1 & prov == 1, kernel(gaussian) normal recast(line)
addplot((kdensity ln_wages if unskilled == 1 & before_after == 0) (kdensity ln_wages if
unskilled == 1 & before_after==1) (kdensity ln_wages if unskilled == 1 & before_after==2))
ksmirnov ln_wages = (unskilled==1) & (prov == 1) //Kolmogorov-Smirnov test to test the
equality of distributions. Look at the p-value for the last line//
sktest ln_wages if unskilled == 1 & prov == 1

kdensity ln_wages if employed==1 & prov == 1, kernel(gaussian) normal recast(line)
addplot((kdensity ln_wages if employed==1 & before_after == 0) (kdensity ln_wages if
employed==1 & before_after==1) (kdensity ln_wages if employed==1 & before_after==2))
ksmirnov ln_wages = (employed==1) & (prov == 1) //Kolmogorov-Smirnov test to test the
equality of distributions. Look at the p-value for the last line//
sktest ln_wages if employed == 1 & prov == 1

//Figure 2 - Kernel//
kdensity school1 if unskilled == 0 & prov == 1, kernel(gaussian) normal recast(line)
addplot((kdensity school1 if unskilled == 0 & before_after == 0) (kdensity school1 if
unskilled == 0 & before_after==1) (kdensity school1 if unskilled == 0 & before_after==2))
ksmirnov school1 = (unskilled==0) & (prov == 1) //Kolmogorov-Smirnov test to test the
equality of distributions. Look at the p-value for the last line//
sktest school1 if unskilled==0 & prov == 1  //Jarque-Bera normality test H0: Normal
distribution//

kdensity school1 if unskilled == 1 & prov == 1, kernel(gaussian) normal recast(line)
addplot((kdensity school1 if unskilled == 1 & before_after == 0) (kdensity school1 if
unskilled == 1 & before_after==1) (kdensity school1 if unskilled == 1 & before_after==2))
ksmirnov school1 = (unskilled==1) & (prov == 1) //Kolmogorov-Smirnov test to test the
equality of distributions. Look at the p-value for the last line//
sktest school1 if unskilled == 1 & prov == 1

kdensity school1 if employed==1 & prov == 1, kernel(gaussian) normal recast(line)
addplot((kdensity school1 if employed==1 & before_after == 0) (kdensity school1 if
employed==1 & before_after==1) (kdensity school1 if employed==1 & before_after==2))
ksmirnov school1 = (employed==1) & (prov == 1) //Kolmogorov-Smirnov test to test the
equality of distributions. Look at the p-value for the last line//
sktest school1 if employed == 1 & prov == 1
```

```
//Figure 1 – Kernel distributions//
kdensity age if unskilled == 0 & prov == 1, kernel(gaussian) normal recast(line)
addplot((kdensity age if unskilled == 0 & before_after == 0) (kdensity age if unskilled == 0
& before_after==1) (kdensity age if unskilled == 0 & before_after==2))
ksmirnov age = (unskilled==0) & (prov == 1) //Kolmogorov-Smirnov test to test the equality
of distributions. Look at the p-value for the last line//
sktest age if unskilled==0 & prov == 1

kdensity age if unskilled == 1 & prov == 1, kernel(gaussian) normal recast(line)
addplot((kdensity age if unskilled == 1 & before_after == 0) (kdensity age if unskilled == 1
& before_after==1) (kdensity age if unskilled == 1 & before_after==2))
ksmirnov age = (unskilled==1) & (prov == 1) //Kolmogorov-Smirnov test to test the equality
of distributions. Look at the p-value for the last line//
sktest age if unskilled == 1 & prov == 1

kdensity age if employed==1 & prov == 1, kernel(gaussian) normal recast(line)
addplot((kdensity age if employed==1 & before_after == 0) (kdensity age if employed==1 &
before_after==1) (kdensity age if employed==1 & before_after==2))
ksmirnov age = (employed==1) & (prov == 1) //Kolmogorov-Smirnov test to test the equality
of distributions. Look at the p-value for the last line//
sktest age if employed == 1 & prov == 1

//ANOVA Table 4//
oneway hours_worked before_after if unskilled==0 & prov==1, tab
oneway hours_worked before_after if unskilled==1 & prov==1, tab
oneway hours_worked before_after if employed==1 & prov==1, tab

//Table 4 - General labour force//
oneway age before_after if employed==1 & prov==1, tab bon
oneway school1 before_after if employed==1 & prov==1, tab bon
oneway income before_after if employed==1 & prov==1, tab bon

//Table 4 - Control group//
oneway age before_after if unskilled==0 & prov==1, tab bon
oneway school1 before_after if unskilled==0 & prov==1, tab bon
```

```
oneway income before_after if unskilled==0 & prov==1, tab bon

// Table 4 - Farm workers//
oneway age before_after if unskilled==1 & prov==1, tab bon
oneway school1 before_after if unskilled==1 & prov==1, tab bon
oneway income before_after if unskilled==1 & prov==1, tab bon

//Table 4 – All unskilled//
oneway hours_worked unskilled if before_after==2 & prov==1, tab bon
oneway hours_worked unskilled if before_after==1 & prov==1, tab bon
oneway hours_worked unskilled if before_after==0 & prov==1, tab bon
oneway school1 unskilled if before_after==0 & prov==1, tab bon
oneway school1 unskilled if before_after==1 & prov==1, tab bon
oneway school1 unskilled if before_after==2 & prov==1, tab bon
oneway age unskilled if before_after==2 & prov==1, tab bon
oneway age unskilled if before_after==1 & prov==1, tab bon
oneway age unskilled if before_after==0 & prov==1, tab bon
oneway income unskilled if before_after==0 & prov==1, tab bon
oneway income unskilled if before_after==1 & prov==1, tab bon
oneway income unskilled if before_after==2 & prov==1, tab bon

//Descriptive statistics - Table 2//
oneway age unskilled if prov ==1, tab bon
oneway school1 unskilled if prov ==1, tab bon
oneway indus unskilled if prov ==1, tab bon
oneway occup unskilled if prov ==1, tab bon
oneway hours_worked unskilled if prov ==1, tab bon
oneway earnings unskilled if prov ==1, tab bon
oneway earnings unskilled if prov ==1, tab bon
oneway income unskilled if prov ==1, tab bon
oneway no_schooling unskilled if prov ==1, tab bon
oneway primary unskilled if prov ==1, tab bon
oneway primary0 unskilled if prov ==1, tab bon
oneway secondary unskilled if prov ==1, tab bon
```

```
oneway matric unskilled if prov ==1, tab bon
oneway degree unskilled if prov ==1, tab bon
oneway postgrad unskilled if prov ==1, tab bon
oneway wages1 unskilled if popgroup==2 & prov ==1, tab bon
oneway wages unskilled if popgroup==2 & prov ==1, tab bon

//Table 3 – Monthly income for farm workers and control group//
oneway income unskilled if year==1994 & prov==1, tab
oneway income unskilled if year==1995 & prov==1, tab
oneway income unskilled if year==1996 & prov==1, tab
oneway income unskilled if year==1997 & prov==1, tab
oneway income unskilled if year==1998 & prov==1, tab
oneway income unskilled if year==1999 & prov==1, tab
oneway income unskilled if year==2000 & prov==1, tab
oneway income unskilled if year==2001 & prov==1, tab
oneway income unskilled if year==2002 & prov==1, tab
oneway income unskilled if year==2003 & prov==1, tab
oneway income unskilled if year==2004 & prov==1, tab
oneway income unskilled if year==2005 & prov==1, tab
oneway income unskilled if year==2006 & prov==1, tab
oneway income unskilled if year==2007 & prov==1, tab
oneway income unskilled if year==2008 & prov==1, tab
oneway income unskilled if year==2009 & prov==1, tab
oneway income unskilled if year==2010 & prov==1, tab
oneway income unskilled if year==2011 & prov==1, tab

//Table 6 – Gender wage differential//
Oneway income gender if unskilled==0 & prov==1 & before_after==0
Oneway income gender if unskilled==0 & prov==1 & before_after==1
Oneway income gender if unskilled==0 & prov==1 & before_after==2
Oneway income gender if unskilled==1 & prov==1 & before_after==0
Oneway income gender if unskilled==1 & prov==1 & before_after==1
Oneway income gender if unskilled==1 & prov==1 & before_after==2
Oneway income gender if employed==1 & prov==1 & before_after==0
```

Oneway income gender if employed==1 & prov==1 & before_after==1

Oneway income gender if employed==1 & prov==1 & before_after==2

Plagiarism Declaration

COMPULSORY DECLARATION:

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works of other people has been attributed, and has been cited and referenced.

Signature: ..... Date: 13/05/2015