

Continuity and Change in South African Labor Market Regulations: the Impact of Employment Equity Act of 1998 on Employment Strategies of Firms.

Wayde Thomas Flowerday
Neil Rankin
Volker Schöer

After the fall of the Apartheid regime, South Africa was not only reintroduced into the global economy through the lifting of sanctions and deliberate trade liberalizations, but various progressive labour regulations were introduced to create a more inclusive labour market. The goal was to create an environment that would improve the quality of employment for South Africans, especially for those who were most disadvantaged under Apartheid. Together these two changes created a tension which firms had to grapple with – how to respond to a new set of labour regulations whilst at the same time facing increased global competition. Against this background we focus on the impact of labour regulation specifically that of the Employment Equity Act of 1998. A key implication of the Act being that it only applies to firms with 50 or more employees, thus making the Act a threshold policy.

Utilising Regression Discontinuity Design techniques, Ordinary Least Squares regressions, as well as descriptive techniques, this paper unpacks the effects of the Act on the South African labour force – particularly with respect to manufacturing firms. This paper shows that this threshold policy results in 2 distinctly different groups of firms once the act is passed. Results reveal that each group treats their labour to capital ratios in a different fashion, with a large number of firms opting to shed employment in order to remain below the threshold for compliance with the Act, and instead embracing higher levels of capital.

This paper concludes that there is a high possibility that the introduction of the Employment Equity Act of 1998 has created a distortion in employment which has resulted in an inefficient allocation of resources at a firm level. What results is a lower employment of labour, particularly at the small, medium enterprise level, marking the intended effect of the particular Act as counterproductive.

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1. Introduction

1.1 Background

With the first democratic elections in South Africa in 1994, the newly elected government inherited an economic system of low growth, high government debt, mass unemployment, poverty and inequality with little worker protection, especially of African workers. To address these socio-economic problems, the newly elected government combined a development path of job creation through macro-economic stability, fiscal discipline and export oriented growth and a radical restructuring of the labour market with a focus on worker rights. Thus, during the 1990s South Africa was not only reintroduced into the global economy through the lifting of sanctions and deliberate trade liberalizations, but various progressive labour regulations were introduced to create a more inclusive labour market. The rationale of these policies was to create an environment that would improve the quality of employment for South Africans, especially those most disadvantaged under Apartheid. Together these two broad policy changes introduced a tension which firms had to grapple with – how to respond to a new set of labour regulations whilst at the same time facing increased global competition. This paper's focus falls directly on that of labour regulation, specifically that of the Employment Equity Act of 1998.

After the fall of Apartheid, the legislative and regulatory environment of the South African labour market was radically transformed, with a key focus of extending a large range of rights to all employees in order to address inequalities created under the Apartheid regime (Benjamin, 2005). However, while the introduction of the new regulatory framework through the Labour Relations Act (LRA), the Basic Conditions of Employment Act (BCEA), and the Employment Equity (EE) Act has created a more secure work environment for some employees (especially in the formal sector), it has been argued that it has significantly increased the cost of employing labour. These cost, however, are presumably more burdensome for smaller firms and firms that are trying to compete in the global market (Rankin, 2006).

The Employment Equity Act (EEA) of 1998 was designed to address unequal access to employment opportunities created by the racially segmented labour market under the Apartheid regime. Thus, by legislating affirmative action, the Act requires firms that employ 50 or more employees to provide a detailed employment strategy over a five year period that outlines how the firm intends to restructure its workforce to reflect the demographic composition in the region in which it operates.

In the latter half of 2015 the South African Department of Labour announced its plans to take approximately 1,400 firms to the labour court for failure to comply with the Employment Equity Act of



1998. This announcement linked to the 2014-15 report of the Commission for Employment Equity which found that the pace of transformation of the private sector had remained slow.

With focus being put heavily back on the South African labour market, this paper aims to explore the shifts in labour market regulation and legislation in South Africa from 1994 onwards, and will investigate the impact of one particular labour market policy – that of the Employment Equity Act of 1998 – on employment and production strategies of South African firms.

The paper shows that the Employment Equity Act of 1998 had indeed created a discontinuity at the 50 employee level; with firms above the 50 employee threshold having significantly less employment, asset value, and capital expenditure relative to firms that fall beneath the threshold. Thus, the introduction of the Act has resulted in two distinctly different groups of firms that have adopted different approaches to how they treat capital and labour within the firm.

1.2 Core research question

What is the impact of the Employment Equity Act of 1998 on firm dynamics for firms that fall around the policy threshold of 50 employees?

1.3 Research objectives

This paper will investigate the impact of the Employment Equity Act on firm dynamics for firms that fall just around the policy threshold of 50 employees. This investigation will be conducted utilizing a Regression Discontinuity Design (RDD) in order to fully understand the effects this size dependent regulation has had on South African firms.

This paper will employ a panel dataset that is comprised of firms that have been matched on unique identifiers, for both 1996, and 2001.



2. Literature review

2.1 A brief history of South African labour regulation

The fall of Apartheid in 1994 prompted a radical transformation of the South African labour market. Through a suite of new labour regulations which were rooted in the Reconstruction and Development Programme (RDP¹) principles of a more inclusive society with equal opportunities and the prevention of worker exploitation, the South African labour market was reformed. These new labour regulations were driven by at least two forces (Edwards et al., 2014). The first was the need to modernize the existing labour regulations to become more inclusive, especially since under the Apartheid regime, many rights of workers that were not white were ignored. The second was the role which organized labour played in the final years of Apartheid and the negotiated transition to democracy. The Congress of South African Trade Unions (COSATU) was an active opponent of the Apartheid system and played an important role in the negotiations surrounding the transition and the crafting of regulations during the early period of democracy (Edwards et al., 2014).

The five main acts² that were introduced during this period consisted of:

- The Labour Relations Act (LRA) of 1995: The key aim of the LRA was to ensure orderly collective bargaining and workplace democracy; as well as to ensure effective labour market dispute resolution through the Commission for Conciliation, Mediation and Arbitration (CCMA). This act covered all workers apart from those employed by the South African defense force, secret services, and essential services³.
- 2. The Basic Conditions of Employment Act (BCEA) of 1997: The key aim of the BCEA was to improve the minimum rights for all workers in South Africa, including part-time workers, but excluding those employed by the South African defense force, secret services, and essential services.

¹ The Reconstruction and Development Plan (RDP) of 1994 was the first major policy plan of South Africa to try to redress the imbalances of the previous administration, socially, economically and spatially. The aim of the RDP was to combine growth, development, reconstruction, redistribution and reconciliation into one strategy.

² A sixth act was added in 2001 by means of the Unemployment Insurance Act (UIA), which set out the conditions pertaining to unemployment insurance.

³Almost twenty years after the introduction of the LRA, a set of amendments to the LRA were passed in 2014. These amendments focused primarily on how to treat part-time and contract workers and those employed through temporary employment services (or labour brokers). These amendments generally strengthen the position of those already in jobs and reduce the flexibility of firms in terms of hiring (Edwards et al., 2014).



- 3. The Employment Equity Act (EEA) of 1998: The key aim of the EEA was to eliminate unfair discrimination and ensure the implementation of affirmative action in South Africa. This act was only pertinent to designated firms i.e. firms with excess of 50 employees.
- 4. The Skills Development Act (SDA) of 1998: The key aim of the SDA was to design and implement national, sector, and workplace strategies to improve the skill set of the South African workforce.
- The Skills Development Levies Act (SDLA) of 1999: This act was utilized to collect funding for the National Skills Fund – a fund which was inherently supported by all employers except for public service, religious, and charity organizations.

The main aim of these acts was to ensure that a socially acceptable minimum standard of working conditions was in place in South Africa, and to bring South African employment legislation into line with the international standards (Black & Rankin, 1998). Since this paper has its primary focus on the Employment Equity Act of 1998, it is imperative that more detail is given surrounding this particular policy.

The rationale of introducing the EEA in South Africa was to enforce transformation on the basis that organizations would not empower sufficient numbers of Black employees of their own free will (Leonard & Grobler, 2006). Leonard & Grobler (2006) go on further to say that there has been some evidence of transformation at work, but the implementation of the EEA is often reduced to a question of legal compliance.

The prevailing literature regarding the EEA of 1998 is relatively thin. The majority of research that has been done surrounding this act is often of a qualitative nature⁴, and has often relied on a survey-type basis in which the researcher utilizes various techniques in order to draw meaning from open-ended questions posed to the subjects. Research surrounding the EEA which has been more quantitative has been focused on the upper echelons of employment, namely the executive and management positions within firms – work that is clearly not representative of the greater population of South Africa, and often criticized by South African labour unions as being "pointless" and "meaningless" within the context of true transformation. This paper fills a void in the existing literature by focusing on the impact of the EEA on smaller firms, particularly those falling around the 50 employee level, thus being more inclusive and more attuned with the population of South Africa.

⁴ See: De Beer & Radley (2000), Denton & Vloeberghs (2003), Ng & Burke (2004), and Oosthuizen & Naidoo (2010)



2.2 The Employment Equity Act of 1998

The Employment Equity Act was enacted by President Nelson Mandela, and the Parliament of South Africa in 1998. The act recognized that "as a result of Apartheid and other discriminatory laws and practices, there are disparities in employment, occupations and income within the national labour market; and that those disparities create such pronounced disadvantages for certain categories of people that they cannot be redressed simply by repealing discriminatory laws [sic]" (Department of labour, 1998).

As a result, the purpose of this act is to "promote the constitutional right of equality and the exercise of true democracy" (Department of labour, 1998), "eliminate unfair discrimination in employment" (Department of labour, 1998), "ensure the implementation of employment equity to redress the effects of discrimination" (Department of labour, 1998), "achieve a diverse workforce representative of our people [sic]" (Department of labour, 1998), "promote economic development and efficiency in the workforce" (Department of labour, 1998), and to "give effect to the obligations of the Republic as a member of the International Labour organization" (Department of labour, 1998). Parts of the act address all employers within the South African labour market (such as Chapter 2 of the act – 'Prohibition of unfair discrimination'), however, this paper is primarily concerned with the aspects that deal with designated employers⁵ and designated employees⁶, which mainly appears in Chapter 3 of the act – 'Affirmative Action'.

Affirmative action measures are those that are intended to ensure that suitably qualified employees from designated groups have equal employment opportunities and are equitably represented in all occupational levels of the workforce. Such measures must include:

- i. Identification and elimination of barriers with an adverse impact on designated groups;
- ii. Measures which promote diversity;
- iii. Making reasonable accommodation for people for designated employees from designated groups;

⁵ A designated employer refers to an employer that employees 50 or more employees. May also be referred to as a 'designated firm'.

⁶ A designated employee refers to an individual that is either black (black is a blanket term to represent African, Coloured, and Indian individuals), female, or disabled who are citizens of the Republic of South Africa by birth or descent, or became citizens of the Republic of South Africa by naturalization. May also be referred to as a 'designated group'.



- iv. Retention, development and training of designated groups, including but not limited to skill development; and
- v. Preferential treatment and numerical goals to ensure equitable representation, which excludes quotas.

In order to implement affirmative action measures, a designated employer is expected to:

- i. Consult with employees this consists of but is not limited to discourse with employees over areas of concern for discrimination in the workplace;
- ii. Conduct analysis;
- iii. Prepare an Employment Equity Plan this plan may not be shorter than one year and not longer than five years, and must include a timetable for the achievement of objectives and goals for each year of the plan; and
- iv. Report to the Director-General on progress made in the implementation of the plan The Director-General may appeal to the labour court of South Africa to impose a fine on a designated employer if the preparation and execution of the Employment Equity Plan are not met.

Furthermore, a designated employer is expected to appoint a manager to oversee the preparation and execution of the Employment Equity Plan, consequently, the designated firm is also expected to make resources available for these endeavors.

It is readily apparent from clauses within the Employment Equity Act (most notably the chapter on 'affirmative action') that the act is a threshold policy, and is only applicable to firms with 50 or more employees. Thus this paper will move on to discuss threshold policies, their impact on firms, and methodologies for their investigation.

2.3 Threshold Effects on Firms

Small firms often face lighter regulation than their larger counterparts. It is economically rational for small firms to only have to comply with a handful of regulations as the cost of compliance may be too high for these firms to face. However, regulation must be phased in as a firm grows – thus creating a phase-in effect at a few finite points which are sometimes referred to as "threshold effects" (Gourio & Roys, 2012). In the case of this paper, the threshold effect being investigated is that of compliance with the Employment Equity Act of 1998 which applies to firms with 50 or more employees.



 Table 1: Divisions among small, and medium enterprises as defined by the National Small

 Business Act

Enterprise Size	e Number of Annual Turnover Employees		Number of Annual Turnover Gross Assets, excluding Employees		Gross Assets, excluding fixed property
Medium	< 100 - 200*.	< 4,000,000 - 50,000,000*.	< 2,000,000 - 18,000,000*.		
Small	< 50.	< 2,000,000 - 25,000,000*.	< 2,000,000 - 4,500,000*.		
Very Small	< 10 - 20*.	< 200,000 - 500,000*.	< 150,000 - 500,000*.		
Micro	< 5.	< 150,000.	< 100,000.		

Source: The National Small Business Act 102 of 1996

Note: Units for 'annual turnover' and 'gross assets' presented above are in South African Rands.

Note: * indicates industry dependence – the large bands shown above indicates the global definition for classification, but each particular industry in the South African economy has its own well-defined size-classification system..

As the preceding table shows, consideration of firms around the 50 employee threshold implies that the act could directly affect firms that can be considered small, medium enterprises (SMEs), and that the EEA is not a policy that is geared towards only the larger South African firms. South Africa's National Development Plan (NDP) recognises the importance of small, and medium enterprises in South Africa as drivers of economic growth, and as absorbers of excess labour within South Africa. According to Abor and Quartey (2010), small businesses contribute approximately 57% to the South African GDP, and are responsible for approximately 61% of South African employment. These figures alone provide a clear indication that small businesses in South Africa have a massive impact on the South African economy.

Bearing in mind afore mentioned divisions, it is important to ascertain what proportion of the South African business environment these divisions represent. The following table obtained from Wittenberg, Arrow and Kerr (2013), is based on figures gathered from the Quarterly Employment Survey of Statistics South Africa which contains employment information on a nationally representative sample of enterprises, from 2005 to 2011. The table shows the composition of the manufacturing sector in accordance with how many employees a firm had.



 Table 2: Composition of the manufacturing sector in accordance with the number of individuals employed

Size Category	Proportion
1-19	0.129
20-49	0.147
50-99	0.131
100-249	0.160
250-499	0.111
500-999	0.076
1000-2499	0.100
2500-4999	0.066
5000+	0.080
Total	1

Source: Wittenberg, Arrow & Kerr (2013)

The preceding table highlights the fact that firms employing 20-49, or 50-99 employees account for approximately, 27% of the manufacturing sector - these are firms that could directly encounter the threshold effects of the EEA, making the EEA a serious consideration for firms within this bracket.

Almeida & Carneiro (2008) studied the effects of labour regulation in Brazil; utilizing data on employment, output, capital, and regulations at specific levels, it was established that labour regulation constrains firm size. Almeida & Carneiro (2008) went on further to state that these negative effects on firm size (when measured in terms of employment numbers) are also likely to be associated with negative effects on overall country employment. This sentiment was echoed by Gourio & Roys (2012) which studied the threshold effects of various labour regulations in France, around the 50 employee threshold. It was revealed that the size distribution of firms became visibly distorted with a large contingent of firms having exactly 49 employees in order to avoid tighter regulation. The paper went on further to state that firms treated the regulations as a sunk cost which was approximately equal to one year of an average employee salary – clearly illustrating that regulation is providing a constraining effect on firm size.

Ramaswamy (2013) further solidifies the idea that threshold effects can be a hindrance to firm size by claiming that there is a "missing middle⁷" within the size distribution of the Indian manufacturing sector. The paper claims that this "missing middle" is a result of threshold effects that are generated by various labour regulations within India. This effect was first observed by Dhar & Lydall (1961), and corroborated

⁷ 'Middle' is in reference to medium-sized firms.



by Mazumdar & Sarkar (2013), where it was stated that the size group of 6-49 workers accounts for more than 55% of total non-household manufacturing in 2005. Hasan & Jandoc (2013) estimated that this number could be as high as 85% in 2005 if household enterprises were included in total manufacturing employment.

Ramaswamy (2013) analyses data from 1998-2008 and reports that this missing middle is still prevalent within India. Firms falling within this size-class have higher contract-worker intensity, which supports the proposition that firms utilize non-permanent workers in order to stay beneath the threshold. These empirical results supported the threshold effects of size-dependent labour regulations and fiscal incentives.

As stated before, South Africa relies heavily on its SME industry for labour absorption and economic growth. If the threshold effects of size-dependent labour regulations (such as those generated by the EEA) hold in the same way that they do within Brazil, France, and India, there may be a cause for concern. This paper will attempt to fill a vital gap in the literature by unpacking potential threshold effects of the Employment Equity Act of 1998, and seeing how South African firms respond⁸.

⁸Due to limited information on the decision making process that lead to the development of the Act, it is not possible for this paper to present alternate scenarios whereby the paper would have been able to measure the impact if there was no Act at all; nor will the paper be able to measure the impact if the Act had been passed for a different threshold; nor will it be able to measure the impact if the Act had not had a threshold and had instead been binding on all firms. In order to tackle any of these alternate scenarios, this paper would have to be able to find information (information that seemingly does not exist) that explains the deliberation process that lead to the enactment of the Employment Equity Act if 1998 as it currently stands. It is possible that the threshold of 50 employees was decided on by following international evidence, or alternatively because 50 employees represents a cut-off point between small and medium business classification as shown by table 1.



3. Theoretical Background

One of the main points of analysis of this paper is how firms respond to EEA in terms of their trade-off between labour and capital. From baseline economic theory on production, it is known that firms will trade-off between capital and labour in order to maintain a pre-specified level of production. Thus, firms aim to optimize production (either through cost minimization or through profit maximization). This trade-off is not new to South Africa and has been happening for a number of years. As the following graph illustrates, there has been a steady rise in the capital-to-labour ratio in manufacturing over time (especially during the 1990s) – thus, production still increased as employment fell due to the higher investment in capital stock. It is possible that this shedding of labour in favour of capital was exacerbated by the implementation of the Employment Equity Act of 1998 – a fact that this paper aims to establish.



Figure 1: Capital-to-labour ratio in manufacturing, 1981-1999

Source: Samson et al.

Intuitively, the cost of labour can be classified as *L*; however, after the passing of the Employment Equity Act of 1998, the cost of labour for firms that are above the threshold of 50 employees becomes $L+\lambda$. Naturally, this implies that the relative cost of capital would be lower at the threshold of 50 employees, and firms would gravitate towards increasing capital employed, and decreasing labour.



Figure 2⁹ : Expected Discontinuity in Profit Construction of Firms



Figure 2 illustrates the proposed discontinuity that would exist within the profit construct of firms. Gourio & Roys (2012) proposed that threshold policies are treated as lump-sum sunk costs by firms. As a result, the relationship between profit and employment would be maintained once the EEA was introduced; however, a discontinuity would be created. Firms would have incentive to be at either point A, or at point B in the preceding figure, but no firm would have incentive to be at point C. As a result, it can be expected that we would see a shedding of employment around the threshold as firms would try to maintain profit levels by reducing costs; alternatively, firms would show a much larger growth in employment to get back to a level of profit that was being generated before the threshold was introduced. In simple terms, a firm has two strategies at its disposal when facing the Employment Equity Act of 1998 – firms can either substitute capital for labour, resulting in decreased employment, or a firm may increase employment dramatically if these firms treat the Act as a sunk cost. Ultimately firms will create a negative effect on the labour market (in terms of decreased employment) only if the first strategy is dominant. Due to the nature of the data at this paper's disposal, it is easy to identify 4 distinct groups of firms within the panel. These are firms that have differed with response to the EEA with regard to how they decided to treat their employment levels. Consequently, these four types of firms are:

- i. Firms that were below 50 employees for both time periods.
- ii. Firms that were above 50 employees for both time periods.

⁹ This figure presents the relationship between profit and employment as a linear relationship for simplicity only – it is more likely that this relationship is actually quadratic in nature.

iii. Firms that were below 50 employees in 1996 and above 50 employees in 2001.

iv. Firms that were above 50 employees in 1996 and below 50 employees in 2001.

These groups can be assumed to be distinctly different from each other in the way that they choose to approach their labour/capital ratios within their firm. The production function that this paper has imposed on these firms is that of a typical Cobb-Douglas. Classically, a Cobb-Douglas production functions is a particular functional form of the production function that is widely used to represent the relationship between two or more inputs and the amount of output that can be produced. In this instance, the inputs utilized are those of capital and labour. The function utilized within this paper can be shown in its linearised form as:

$$\ln(Y) = \ln(A) + a_1 \ln(L) + a_2 \ln(K)$$
 (1)

As a result, it is expected that these 4 different groups will exhibit different production functions after the passing of the employment equity act. This will be further discussed under section 6 of this paper.

4. Hypothesis

This paper hypothesizes that there will be a noticeable decrease in firms with employment numbers just above the 50 employee threshold, and an increase in the number of firms with employment numbers just below the threshold after the Employment Equity Act was passed.

It is hypothesized that firms will adjust their mix of inputs in the production process by substituting capital for labour. Especially, it would be anticipated that firms will try to move just below the 50 employee threshold by reducing its workforce. Consequently, it would expected that firms would employ higher capital expenditure, higher labour productivity and average wages to increase for firms below the 50 employee threshold compared to firms just above the 50 employee threshold, especially for firms that moved from above the 50 employee threshold to below the 50 employee threshold



5. Data and methodology

5.1 Data

This paper will make use of one primary dataset; a matched dataset using data from the Manufacturing Census of 1996, and the Large Sample Survey (LSS) of 2001. Statistics South Africa (Stats SA) has carried out a census of the 3 digit manufacturing sector on a biannual basis (Fedderke & Simbanegavi, 2008), the last of which was conducted in 1996. After this, Stats SA started to produce the Large Sample Survey, the first of which was released in 2001. In order to make this data useful, this paper has matched firms from the 1996 census to the 2001 LSS according to firm identification numbers – as a result, 1471 firms were matched. The dataset captures variables such an employment numbers, book value of fixed assets at the beginning of the year (asset value), capital expenditure on new assets, wages, and output value. This panel dataset will be referred to as the LSS 96/01 from this point forward.

5.1.2 Dataset limitations

Naturally, there are limitations to the data that is being utilized. Firstly, the dataset can be considered small, especially with regard to the number of firms that fall within the neighbourhood of the 50 employee threshold. Secondly, since the data collected deals exclusively with manufacturing firms, the data is not representative of the South African population. Thirdly, the dataset cannot account for firms that split their business into separate entities in order to trade as two entities, and consequently escape the regulations imposed by the EEA.

The dataset is also not able to observe firms that left the market due to the introduction of the EEA, nor the firms that didn't enter the market due to the presence of the EEA.

5.2 Variables

There are a handful of variables of interest to this paper. These variables will shed light on the manner in which firms deal with the implementation of the Employment Equity Act of 1998. A short description of why each variable is important, and what this paper expects that variable to reflect is as follows:

• **Employment numbers**: This variable is crucial to the paper as the paper aims to investigate the impact that the Employment Equity Act of 1998 had on firm employment. It is expected that employment numbers would fall for firms trying to remain (or transition to) below the threshold of the Act.



- Book value of fixed assets at the beginning of the year (asset value): This measure provides insight to the labour-capital ratio that a firm has. It is to be expected that firms that choose to actively engage with the Act will have higher asset values than other firms.
- **Capital expenditure on new assets**: If firms change the level of labour that they employ, it is expected that a shift would also be seen in terms of capital. Firms would trade off labour for capital if they are trying to remain (or transition to) below the threshold of the Act.
- Average wages: The average wage would indicate the firm's behaviour and stance towards labour once the Act had been passed. If a firm were to stay below the threshold, it can be expected that firms of this nature would pay a higher average wage in order to retain more skilled staff. Firms falling above the threshold would show the opposite as they would not have the need to pay an efficiency wage.
- **Output value**: This paper hypothesizes that firms will trade off labour with capital if the firm actively tries to avoid having to comply with the Act. This paper expects that output should not change, as firms would change their labour-capital ratios in such a way that output remains constant.
- Labour productivity: This variable is important in regard to this paper as it further indicates how firms are adjusting both their labour-capital ratio, and their output once the Act was implemented. This paper expects that labour productivity would rise for firms that actively shed employment to fall below the threshold, as these firms would aim to have their output remain constant, while dealing with a smaller workforce.

Having outlined the variables that are of interest to this paper, the methodology pursued will now be discussed.

5.3 Methodology

This paper will employ a Regression Discontinuity Design (RDD), Ordinary Least Squares Regressions, and descriptive statistics as its methodologies for analysis.

5.3.1 Descriptive approach

The descriptive statistics approach will allow this paper to illustrate changes that had occurred within firms that were affected by the implementation of the Employment Equity Act. Furthermore, this approach will allow the paper to contrast how firms have adapted in terms of their hiring policies, capital structure, production technologies, and wage structures to the implementation of the act.



5.3.2 Ordinary Least Squares

In order to understand the relationship between capital and labour more intensely, a Cobb-Douglas production function will be imposed on the data in question; this function takes the form of:

$$Y(L, K) = AL^{a_1}K^{a_2}$$
 (2)

which may be linearised as:

$$\ln(Y) = \ln(A) + a_1 \ln(L) + a_2 \ln(K)$$
 (3)

Utilising ordinary least squares regressions, this function will be estimated for various neighbourhoods within the data.

5.3.3 Regression Discontinuity Design

This paper makes use of a sharp regression discontinuity design. Utilization of the RDD methodology allows for the causal effects of interventions by assigning a cutoff or threshold above or below which an intervention is assigned to be elicited. In this paper, the intervention that is considered is that of the introduction of the Employment Equity Act; as a result, the threshold that will be utilized is that of 50 employees; furthermore, the running variable in question will always be employment. This paper will employ the RDD on the LSS 96/01 in order to ascertain what effects the Employment Equity Act of 1998 had on the firms within the sample. This dataset is ideal as the EEA falls exactly between the two waves, which allows this paper to track firms prior to the implementation of the Act when they were less likely to be aware of the Act, as well as to three years after the Act's implementation. Furthermore, as this paper uses 50 employees as the policy threshold, this paper will consider firms with 40-49 employees as the data to be used before the threshold, and firms with 50-60 employees as the firms after the threshold – this bandwidth is based on similar decisions that were made by the studies that were discussed under the literature review.

5.3.3.1 Parametric

The purpose of this methodology is to provide a graphical depiction of the variables of interest and how they may differ before and after the 50 employee threshold. A typical approach is followed here as proposed by Lee & Lemieux (2009), whereby bins are generated, the mid-points of these bins are found, and interaction terms for treatment are generated before running polynomial regressions. These polynomial regressions take the form of:

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$$Y_{i} = \alpha + \beta_{1}X_{i} + \beta_{2}X_{i}^{2} + ... + \beta_{p}X_{i}^{p}$$
$$+ \gamma d_{i} + \delta_{1}d_{i}X_{i} + \delta_{2}d_{i}X_{i}^{2} + ... + \delta_{p}d_{i}X_{i}^{p}, \qquad (4)$$

where Y_i represents the variable of interest, X_i is the running variable (1996 employment), and d_i the assignment dummy variable.

In RDD, the shape of the functional relation between the outcome variable and the assignment score is of large importance. Misspecification of the model can lead to biased estimation of the treatment effect (Lee & Munk, 2008). Bias may also be increased in model estimates if the data points utilized are too close to the cut-off (Lee & Munk, 2008). When a polynomial model is fitted to the data, a term of higher order than the data may suggest should be included in the starting model; however, this leads to inefficient estimates.

To reduce bias due to model misspecification, over-fitting of the model may be necessary but this will require either a larger sample size or lower efficiency of estimates; while under-fitting of the parametric model leads to increased bias. There is therefore a need to strike a balance between efficiency and bias - this is known as the "variance-bias trade off".

Gelman & Imbens (2014) add to the argument by showing three, somewhat related reasons why highorder polynomials are a poor choice in regression discontinuity analysis. Firstly, estimates based on a polynomial regression can be interpreted as the difference between a weighted average of the outcomes for the treated and a weighted average for the controls – these weights depend only on the threshold and the values of the forcing variable, and not on the values of the outcomes. The paper found that weights implied by higher order polynomial regressions were not as attractive as those for local linear regressions. Secondly, the paper argues that results are highly sensitive to the order of the polynomial that is imposed. Thirdly, Gelman & Imbens (2014) state that inference based on higher order polynomials is often poor – which can have misleading results.

For the reasons mentioned above this paper begins by over-fitting the model with more polynomial and interaction terms than deemed necessary. The paper proceeds by eliminating insignificant orders (moving from higher order to lower order), stopping once the polynomial order is shown to be significant. After proceeding in this fashion, it was established that a second-degree polynomial provided the best fit for the available data, with a bandwidth of 10 units either side of the 50 employee



threshold for the parametric design¹⁰. These results are also supported by descriptive graphs shown later in this paper.

5.3.3.2 Non-parametric

Non-parametric estimation does not represent a solution to functional form issues raised by parametric RD designs, and should therefore be viewed as a complement, rather than a substitute for parametric estimation (Lee & Lemieux, 2009). It is for this reason that the non-parametric approach is also utilized by this paper. As mentioned above, this paper makes use of a sharp regression discontinuity design; whereby the impact of the threshold generated by the EEA can be calculated via the following expression (Khandker, Koolwal, & Samad, 2010):

$$I = (y^{+} - y^{-})/(s^{+} - s^{-}),$$
(5)

where y^{+} is the mean outcome for firms that fall above the 50 employee threshold, and y^{-} is the mean outcome for firms that fall below the 50 employee threshold; s^{+} is the mean treatment status for firms that are expected to comply with EEA regulation, and s^{-} is the treatment status for firms that are not expected to comply with EEA regulation. This paper treats the RD design as strict, implying that the treatment status of a firm is a deterministic function of whether or not the firm falls above the 50 employee threshold. As a result firms that fall above the threshold are assigned $s^{+}=1$, and firms that fall below the threshold are assigned $s^{-}=0$. The design is considered sharp rather than fuzzy due to the fact that the paper has no meaningful way of measuring firm compliance with EEA. In this respect, what is being measured is intention to treat (ITT) – implying that this paper is truly measuring the lower bound of treatment on firms.

It must be noted that the parametric and the non-parametric approaches have different bandwidths. The bandwidth selected for the parametric approach was based on the need to keep a large enough sample size, while not increasing the bias of estimators from being too close to the threshold; this reasoning has been reiterated by previous studies that have been cited within the literature review of this paper. The non-parametric approach has a stricter method for selecting optimal bandwidth available to it; this is the approach offered up by Imbens & Kalyanaraman (2009).

¹⁰ This bandwidth was selected to create a large enough sample size for the parametric regression discontinuity design, as well as to be in-keeping with the prevailing literature.



Imbens & Kalyanaraman (2009) argue that there is an optimal, data dependent, bandwidth choice rule available when selecting the optimal smoothing parameter (bandwidth) for the regression discontinuity estimator in a non-parametric design. Utilising this rule through the application of an additional Stata package, "RD", the optimal bandwidth is shown to be 5 units on either side of the 50 employee threshold.

This paper will proceed by running the parametric analysis with the bandwidth of 10 units. This bandwidth will also be applied to the non-parametric approach, before running the non-parametric at its optimal bandwidth of 5 units – comparisons between the two will be noted and assessed.



6. The Response to EEA – Analysis of 1996/2001 data.

This section of the paper will deal exclusively with the LSS 96/01 sample, and will utilize the methods discussed earlier in order to investigate the impact of the Employment Equity Act on firms within South Africa. This section will look at the impact the Act had on firms when it was unanticipated, and consequently how firms changed their employment strategies, capital outlay, and wage structures once the Act had been passed.



Figure 3: Number of firms per employment bracket in 1996, and 2001

The passing of the Employment Equity Act in 1998 could not be anticipated by firms – thus, it is unlikely that many firms had managed to adjust to the threshold effects that were imposed by the Act, before the Act was passed. Figure 3 plots the firm size distribution of the LSS 96/01 sample.

In the period of 1996 employment showed no noticeable patterns. However, once the EEA was passed in 1998, the line-plot of 2001's employment numbers elicits a concise result. After the passing of the Act, firm employment started to cluster below the 50 employee threshold, with a noticeable dip in the number of firms employing more than 50 employees. There is an obvious increase in the number of firms falling below the 50 employee threshold, and a clear decrease in firm numbers above the threshold. As expected, the employment bracket showing the greatest increase is that of 49 employees – eliciting the idea that many firms were willing to decrease employment numbers to just below the



threshold, but not a large degree further. With firms acting according to a priori expectation, it is equally important to take note of how output reacted to the changes in firm employment.¹¹

In order to investigate the potential effects that the Employment Equity Act may have had, it is vital to look at the average levels of employment, asset value, capital expenditure on new assets, wages, and output value in 1996, 2001, and the average differences between the two for firms that were below, and above the 50 employee threshold. These figures are summarized in table 4.

Table 4: Average levels, and average differences for firms above and below the 50 employee threshold in 1996, and 2001 (R'000s).

	Average level for firms with 40-49 employees (1996/2001)	Average level for firms with 50-60 employees (1996/2001)	Average change for firms with 40-49 employees (2001 – 1996)	Average change for firms with 50-60 employees (2001 – 1996)
Asset value	1,212.60 / 1,528.06	1,305.60 / 1,787.88	360.72	417.18
Labour productivity*	5.11 / 5.17	5.19 / 5.28	.08	.20
Output	9,816.19 / 11,905.52	11,492.62 /	2,867.26	2,752.08
		13,976.99		
Average wages per employee	42.22 / 44.42	43.20 / 44.46	1.96	3.04
Capital expenditure on new	265.47 / 309.98	216.75 / 230.37	54.21	-5.74
assets				

Note: All figures quoted in 1996 Rands.

* Labour productivity is defined as total firm output divided by total firm employment.

The preceding table highlights what happened to two different classes of firms after the passing of the Employment Equity Act. The first group is comprised of firms that had employment numbers falling within the band of 40-49 employees in 1996 (below); the second group being that of firms with 50-60 employees in 1996 (above).

The first figure to stand out is that of the average change on capital expenditure on new assets for firms with 40-49 employees. This figure stands at an average of R54,211, which elicits the idea that these firms are becoming more capital intensive in order to avoid hiring of additional labour. Consequently,

¹¹ Table A1 in Appendix 1 shows figure 3 in numerical terms.



their 50-60 employee counterparts showed a negative average difference of R5,742, showing a slowdown in capital expansion. Both groups of firms showed growth in terms of output, both of which came close to the R2,800,000 mark, however, it can be concluded that this growth in output is likely to have been attributed to a growth in capital of the firm, as labour productivity was virtually unchanged for both groups (and is also fairly equal in both groups). Knowing that employment numbers had changed, which was illustrated earlier on by the clustering effects shown in figure 3. It can be concluded that the capital expenditure on new assets was the driving force behind not only maintaining output, but increasing it.

Figure 4: Average difference in log of capital expenditure on new assets of firms above and below the 50 employee threshold in 1996, in terms of 2001 employment



These average levels and average differences provide mass insight into the practices of firms in the presence of the Employment Equity Act, but it is more illuminating to follow one particular group of firms and see how they changed over time. The following series of graphs illustrate the average differences¹² that occurred for firms that fell within the 40-60 employee bracket in 1996 for all of afore mentioned variables, plotted against employment in 2001. Average differences are plotted against the Y-axis, with the X-axis measuring 2001 employment figures. All blue lines reference firms that had 40-49 employees in 1996, and all red lines those firms that had 50-59 employees in 1996.

¹² All average differences were calculated as the mean of the 2001 value less the 1996 value.



The first major finding to emanate from figure 4 is that capital expenditure on new assets for firms that were below the threshold in 1996 outstrips that of firms that were above the threshold in 1996, when looking at the 50 employee mark in 2001. This prompts the idea that these firms were intent on keeping employment levels below the threshold, and instead substituting away from labour towards capital. Furthermore, firms that were below the threshold in 1996 and above it in 2001 tend to show a downward slope in capital expenditure, yet again reiterating the clear relationship between capital and labour – the firms that chose to increase employment consequently started spending less on capital expansion. However, it is not only the capital expenditure on new assets that is of interest to this paper, hence the following graph will illustrate the average difference in asset values for firms that were above and below the threshold in 1996.

Figure 5: Average difference in asset value of firms above and below the 50 employee threshold in 1996, in terms of 2001 employment



As is evident from the preceding graph, firms that were above the 50 employee threshold in 1996 show an average difference that tracks zero. However, firms that were below the threshold in 1996, and above it in 2001 showed a very high average difference in asset value. This illustrates that firms that chose to cross the threshold and start to comply with the Employment Equity Act regulations did so in order to accelerate their growth through higher employment, and capital values. This is concurrent with



the proposed model in the theoretical background of this paper – firms aim to maintain output by either shedding employment, or by increasing it exorbitantly in order to try and get back to the initial level of output that was attained before the creation of the discontinuity created by the implementation of the EEA.

Figure 6: Average difference in average wages per employee of firms above and below the 50 employee threshold in 1996, in terms of 2001 employment



Figure 6 shows the average difference in average wages per employee; it is easily recognizable that firms that were above the threshold in 1996, and subsequently below in 2001 had a higher average difference in wages than those that had remained below the threshold. This is indicative of firms choosing to pay higher wages in order to retain skilled, and efficient labour in order to try and maintain their level of output. Conversely, firms that were below the threshold in 1996, and above it in 2001 paid lower wages as the need to pay efficiency wages in order to retain a skilled labour force to the initial level of output was traded against an increased workforce.

Figure 7: Average difference in output of firms above and below the 50 employee threshold in 1996, in terms of 2001 employment



Perhaps the most important variable considered is that of the average change in output. As figure 7 illustrates, for the most part, the change in output is close to 0, especially for firms that were above the 50 employee threshold in 1996. This is a key finding as it shows that output was maintained irrespective of a firm's decision to switch employment strategies. Furthermore, firms that actively chose to cross from below the threshold in 1996 to above it in 2001, showed a positive average difference, showing that these firms experienced output growth, and consequently chose to keep growing their firms while accepting the regulation of the Employment Equity Act as a sunk cost.



Figure 8: Average difference in labour productivity of firms above and below the 50 employee threshold in 1996, in terms of 2001 employment



At the threshold, both firms that were above and below the 50 employee threshold in 1996 have a very similar log of labour productivity – a fact that was already easily observed in table 4. However, what is interesting is the fact that firms that were above the threshold in 1996 have a fairly constant positive average difference in labour productivity across all levels of employment in 2001. This is explained by these firms either having fewer employees, higher output, or a smaller negative change in output relative to a negative change in employment. Firms that were below the threshold in 1996 offer up a more variable trend in terms of their average difference in labour productivity.

This paper is focused on the threshold effects provided by the Employment Equity Act of 1998, as a result, it is important to establish that firms on both sides of this threshold before the Act was passed were intrinsically the same via their inherent characteristics. The following tables provide the mean values of wages, output, capital expenditure on new assets, asset value, and labour productivity for firms falling either just above the threshold, or just below it. This is done for both the 40-49/50-59 and 45-49/50-55 bands for reasons that have been previously discussed in this paper.



	45-49 employees	50-55		
	(R '000)	employees		
		(R '000)		
	Mean	Mean	t-stat	Pr(T > t)
Asset value	1,212.60	1,305.60	-0.79	0.43
Capital Expenditure On New Assets	265.47	216.75	0.04	0.97
Output	9,816.19	11,492.62	-1.10	0.27
Average Wages	42.22	43.20	-0.25	0.80
Labour Productivity	5.11	5.19	-0.66	0.51

Table 5: Mean characteristics of firms above/below 50 employee threshold in 1996

Table 6: Mean characteristics of firms above/below 50 employee threshold in 1996

	40-49 employees	50-59		
	(R '000)	employees		
		(R '000)		
	Mean	Mean	t-stat	Pr(T > t)
Asset value	1,167.33	1,370.70	-0.93	0.35
Capital Expenditure On New Assets	255.77	236.11	0.89	0.37
Output	9,038.26	11,224.90	-2.38	0.02
Average Wages	42.46	41.41	0.38	0.70
Labour Productivity	5.09	5.08	0.12	0.91

Via basic inspection it is easily observable that the means of each category are fairly close to each other, however, this is not sufficient to state that these two groups are similar to each other. In order to establish similarity, a basic Student's t-test was employed for independent samples with equal variances.



As the Student's t-test reveals in table 5, all of the variables in question have p-values that are well past the value of 0.05, thus, at a 95% confidence level it may be said that the two groups are similar, and not different. As a result, these two groups are perfectly comparable, and this paper may continue on to use them within the intended RDD analysis. As it is seen in table 6, p-values of all variables besides output indicate similarity at the 95% level. Since output is still significantly similar at the 10% level, it is sufficient for this analysis the similarity is high enough for this band to be utilized within analyses of this paper.

6.1 Parametric Analysis

The preceding analysis is useful, and indicative of the fact that prior to the implementation of the EEA in 1998, firms falling around the threshold were inherently similar; due to this similarity, this allows the paper to proceed with its parametric analysis of the impact that the EEA may have had on firms in 2001.

Table 7 below illustrates the results of estimating equation (4) in both first, and second-degree polynomials for variables of interest that include, output, capital expenditure, asset value, labour productivity, and average wages per worker. These regressions were restricted to include only firms that had between 40 and 59 employees in 1996. The most noticeable result is that all 5 regressions in the second-degree polynomial exhibit impacts that are significant at, at least the 5% level. All of the coefficients of impact (y) exhibit negative signs, implying that after the introduction of the EEA, there was a decrease in output, asset value, capital expenditure, average wages per workers, and labour productivity. It is to be expected that the linear results would potentially have incorrect signs and magnitude, as well as being insignificant due to the fact that the production function, and relationship between capital, labour, and other variables would not be linear, but more guadratic in nature, hence the quadratic results are the ones towards which attention should be given. These results reiterate the findings presented by figures 4-8; most notably the fact that firms moving from below the threshold in 1996 to above it in 2001 show a decrease in a capital expenditure. This directly corroborates the substitution of labour with capital. Furthermore, it is also noticeable that average wages had decreased for firms that had gone from below to above the threshold - this is intuitive since these firms have no need to pay higher wages in order to retain more skilled and efficient staff. The rest of these quadratic results can be interpreted in a similar fashion.



Table 7: Mean characteristics of firms above/below 50 employee threshold in 1996 (40-49/50-59 bandwidth)

	Linear	Quadratic
Capital Expenditure 2001		
γ	3.97	-277.921***
	(6.134)	(18.067)
Constant	691	60.267***
	(1.792)	(16.116)
Asset Value 2001		
γ	899	-111.718***
	(2.935)	(17.467)
Constant	7.241***	17.312
	(.590)	(12.091)
Output 2001		
γ	3.341	-104.633***
	(2.199)	(30.477)
Constant	8.565***	51.054
	(1.406)	(29.970)
Average Wages 2001		
γ	.867	-43.666**
	(1.085)	(16.575)
Constant	4.486***	32.887**
	(1.033)	(11.724)
Labour Productivity 2001		
γ	2.502*	-48.121**
	(1.204)	(20.516)
Constant	5.156***	26.421*
	(.975)	(13.748)

Note: *p<0.10 **p<0.05 ***p<0.01

Standard errors are given in parentheses



These results of the preceding parametric analysis are depicted graphically below. The graphs show both the linear and quadratic RDD for the variables of interest and a noticeable, significant "jump" occurs in each graph at the 50 employee threshold.Following the suggestion of (Lee & Lemieux, 2009), a non-parametric approach will now be utilized in order to complement the parametric RD design estimation, and as a way to ensure robustness of the findings.



Figure 9: Parametric RDD of the log of Capital Expenditure in 2001



Figure 10: Parametric RDD of the log of Asset Value in 2001



Figure 11: Parametric RDD of the log of Output in 2001





Figure 12: Parametric RDD of the log of Average Wage in 2001



Figure 13: Parametric RDD of the log of Labour Productivity in 2001





6.2 Non-parametric Analysis

Following the preceding parametric analysis, this section deals with the application of a non-parametric approach to the LSS 96/01. The utilization of a non-parametric approach is heavily useful in this paper with the ultimate benefit of the non-parametric approach being that it does not assume a functional form, and the data alone dictates the functional form that is employed. The following table presents the treatment effect size (the observed coefficient) which is estimated via equation (5), the estimate bias, the estimate standard error, as well as the t-statistic in order to test the hypothesis that the treatment effect is different from zero.

	Observed	Bias	Std. Error	t-stat
Employment	3.761	400	4.242	.887
Output	2,121.248	138.287	2,326.026	.912
Asset Value	46.398	38.819	396.956	.117
Capital Expenditure	-136.468*	21.050	81.335	-1.678
Average Wages	550	215	4.076	135
Labour Productivity	.083	.008	.090	.924
Δ Employment	-6.951*	445	4.161	-1.670
∆ Output	-335.701	157.342	1,805.665	186
Δ Asset Value	-115.620	34.587	367.361	315
Δ Capital Expenditure	-105.858	6.270	102.671	-1.031
∆ Average Wages	.289	116	3.725	.078
Δ Labour Productivity	.0598	.011	.064	.929

Table 8: Strict regression discontinuity design results of various outcome variables (40-60)

Table 8 illustrates the results of the non-parametric RDD on the bandwidth of 40-49/50-60 employees. Significance only emanates from capital expenditure, and the change in employment. With a negative sign on the capital expenditure coefficient, this would constitute firms that had grown their employment base, and had switched towards labour and away from capital, which is in keeping with a priori expectation.

What is of more interest in this set of results in the change in the variables as outcomes. The change in employment, asset value, capital expenditure, average wages, labour productivity, and output were constructed by taking the deflated 2001 values and subtracting the 1996 values. These variables were then estimated using the same non-parametric approach, and illustrate the relative changes between the treated and non-treated firms.



It is apparent that the change in employment produces a significant result. Relative to firms below the threshold of 50 employees, firms above the threshold would have 7 employees less; i.e. if firms below the threshold (non-treated) grew their employment base, the treated firms would have grown by 7 employees less than the firms below them.

However, with so few significant estimates found within these results, it is important to recall the earlier argument by Imbens & Kalyanaraman (2009) surrounding the optimal bandwidth for non-parametric RDD. Following the procedure outlined by their paper, the bandwidth utilized is tightened to be optimal – this should lessen the bias witnessed in some instances of the previous results, while the optimal design strives to strike a better balance between bias and variance. As previously discussed, this optimal bandwidth lies at 5 units either side of the threshold. Utilising the tightened bandwidth, the non-parametric regression discontinuity design was run again and the following results were obtained.

	Observed	Bias	Std. Error	t-stat
Employment	-5.914	0.034	6.059	-0.976
Output	-755.622	-583.687	3,037.546	-0.249
Asset Value	-666.738*	-66.810	532.733	-1.282
Capital Expenditure	-476.591***	-11.826	198.055	-2.406
Average Wages	1.007	-0.576	6.572	0.153
Labour Productivity	0.123	-0.018	0.158	0.779
Δ Employment	-11.161**	-0.018	6.036	-1.849
∆ Output	-1,471.169	-358.288	1,738.149	-0.846
Δ Asset Value	-544.415**	-48.081	277.300	-1.963
Δ Capital Expenditure	-331.438***	-3.803	136.517	-2.428
Δ Average Wages	1.779	-0.331	4.920	0.362
Δ Labour Productivity	0.090	-0.013	0.105	0.854

Table 9: Strict regression discontinuity design results of various outcome variables (45-55)

Note: *p<0.10 **p<0.05 ***p<0.01

After tightening the bandwidth, asset value and capital expenditure are shown to be significant, with both estimates exhibiting negative signs - reinforcing the idea that both capital expenditure and asset value decreased for firms that were below the threshold of 50 employees in 1996, and above it in 2001. This makes intuitive sense as these firms would constitute firms that had grown their employment base, and had switched towards labour and away from capital.

Change in employment, change in asset value, and change in capital expenditure all produce significant results. Utilising the same interpretation as for the previous table's results reveals that firms above the threshold are growing slower in terms of assets, capital, and employment relative to their smaller



counterparts. This is concerning as it should be expected that larger firms (in relative terms) would be more adept at growing, adding to the economy, and absorbing excess labour.

6.3 Analysis of 4 groups

Up until this point, this paper has shown results on how firms that were within a 10 employee radius of the threshold in 1996 had responded in terms of their 2001 characteristics. This section of the paper will unpack the story further, and delve into what characteristics exist between the four groups that were identified earlier. This will be done utilizing an Ordinary Least Squares approach in order to approximate a Cobb-Douglas production function for each of the four groups. The following equations show the estimations of the Cobb-Douglas production functions for each of the groups in question. The equations are estimated utilising 2001 data, and standard errors are shown in parentheses.

Group 1: Above threshold in 1996, below threshold in 2001

$$\ln(Y) = 3.896 + 0.834 \ln(L) + 0.328 \ln(K)$$

(0.466)*** (0.129)*** (0.056)***

Group 2: Above threshold in 1996, above threshold in 2001

$$ln(Y) = 7.088 + 0.248 ln(L) + 0.202 ln(K)$$

(1.302)*** (0.319) (0.067)**

Group 3: Below threshold in 1996, above threshold in 2001

 $\ln(Y) = 6.560 + 0.597 \ln(L) + 0.075 \ln(K)$

(1.266)*** (0.300)** (0.068)

Group 4: Below threshold in 1996, below threshold in 2001

 $\ln(Y) = 4.448 + 0.799 \ln(L) + 0.231 \ln(K)$

(0.742)*** (0.213)*** (0.070)**



The first noticeable implication is that both group 1, and group 4 have increasing returns to scale, while group 2, and group 3 have decreasing returns to scale. Since these production functions are based on 2001 data, this could speak to the idea that group 2, and group 3 are in fact above the 50 employee threshold in 2001; while groups 1, and 4 are below it. This could be an implication that due to the implementation of EEA, firms experience decreasing returns to scale, as they may not be producing at optimal combinations of capital and labour due to the them being restrained to a lower level of labour due to the implementation of the EEA.

Furthermore, when studying the marginal products of capital and labour for each of the above groups, it is noticeable that the marginal product of labour is higher for firms that are below the threshold in 2001 (groups 1, and 4), than for groups that are above it. This is an obvious finding in terms of traditional theory as marginal product is usually a decreasing function; however, since it could well be the case that the firms have been forced to reduce employment in order to escape compliance with the EEA, it is possible that these firms are missing out on a rather large potential marginal product of labour, and are instead having to resort to the significantly lower marginal product of capital.



7. Conclusion

This paper has explored the effects of the Employment Equity Act of 1998 on firms in South Africa, by using panel data from 1996, and 2001. This allowed the paper to utilize Regression Discontinuity Design in order to analyze the effect of the 50 employee threshold that was imposed by the Act.One of the primary findings of this paper is that the introduction of the Employment Equity Act of 1998 resulted in a clustering effect around the 50 employ threshold that the Act had imposed. There was a noticeable cluster of firms at the 49 employee level that were actively trying to escape the additional regulation by shedding employment. Following conventional production theory, firms that had chosen to accept the Act as a sunk cost had increased employment by a large degree in order to maintain initial output levels, and furthermore, these firms had also increased their capital investment and asset value levels in order to further facilitate growth of the firm.

The utilization of both parametric and non-parametric regression discontinuities confirmed the fact that the EEA had indeed created a discontinuity at the 50 employee level; with firms above the threshold having significantly less employment, asset value, and capital expenditure relative to firms that fell beneath the threshold. Thus, the introduction of the Act has resulted in two distinctly different groups of firms that have adopted different approaches to how they treat capital and labour within the firm.

Due to the nature of the data available to this paper, the paper was able to unpack firms into 4 distinct groups, namely: firms that stayed above the threshold in both 1996, and 2001; firms that stayed below the threshold in both time periods; firms that were above the threshold in 1996, and below it in 2001; and firms that were below the threshold in 1996, and above it in 2001.

By fitting a Cobb-Douglas production function to each of these four groups through an Ordinary Least Squares estimation technique, it was established that these four groups treat their labour capital ratios very differently to each other. It was further revealed that the marginal product of labour is higher for firms that are below the threshold in 2001 than for groups that are above it. Since it could well be the case that the firms have been forced to reduce employment in order to escape compliance with the EEA, it is possible that these firms are missing out on a rather large potential marginal product of labour, and instead have to resort to the significantly lower marginal product of capital.

Ultimately these results create a sense of concern surrounding the South African labour market. Due to this threshold, it is possible that the distortion in employment that has been created can be labeled as



an inefficient allocation of resources – this forces the notion that the South African market is comprised of firms that are in essence heterogeneous, and thus, future policy cannot be homogenous in its approach. If small, and medium enterprises (SMEs) are truly to be the drivers of job creation in South Africa, it is possible that this act has created a distortion that does not allow these SMEs to deliver on their potential for the South African economy. While the notion of transformation within the labour forces is imperative, especially for a nation that had suffered under years of segregation and discrimination, it would seem that the introduction of the Employment Equity Act of 1998 has not had an optimal effect, and has actually led to a situation whereby unemployment may be exacerbated. For the labour market to become truly transformative, while not creating a larger problem in terms of the employment context of South Africa, it would seem that more research would need to be conducted, and a better solution found.



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9. Appendix

	1996		2001		
Number of	Number of	Percentage	Number of	Percentage	Net change (2001-
employees	firms		firms		1996)
40	20	8.85%	16	7.21%	-1.64%
41	15	6.64%	6	2.70%	-3.94%
42	10	4.42%	11	4.95%	0.53%
43	10	4.42%	10	4.50%	0.08%
44	9	3.98%	10	4.50%	0.52%
45	14	6.19%	13	5.86%	-0.33%
46	7	3.10%	9	4.05%	0.95%
47	8	3.54%	14	6.31%	2.77%
48	10	4.42%	17	7.66%	3.24%
49	8	3.54%	24	10.81%	7.27%
50	9	3.98%	18	8.11%	4.13%
51	13	5.75%	10	4.50%	-1.25%
52	11	4.87%	7	3.15%	-1.72%
53	8	3.54%	4	1.80%	-1.74%
54	13	5.75%	3	1.35%	-4.40%
55	11	4.87%	8	3.60%	-1.27%
56	7	3.10%	6	2.70%	-0.40%
57	15	6.64%	9	4.05%	-2.59%
58	11	4.87%	10	4.50%	-0.37%
59	9	3.98%	11	4.95%	0.97%
60	8	3.54%	6	2.7%	-0.84%
Total	226	100%	222	100%	

Table A1: Number of firms per employment bracket in 1996, and 2001

Note: Percentage is the number of firms for each employment bracket over the range 40-60, divided by the total number of firms between 40 and 60 employees. Number of firms is the raw number of firms in each employment bracket.