Impact of market deregulation on the competitiveness of commercial milk producers in East Griqualand: a unit cost ratio (UCR) analysis: 1983-2006

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Abstract

This study investigates the impact of dairy market deregulation on the competitiveness of milk producers who comprise the East Griqualand (EG) study group in KwaZulu-Natal and the Eastern Cape Province of South Africa. The study uses a microeconomic approach, the unit cost ratio (UCR) method of competitiveness analysis, to assess changes in the relative competitiveness of EG milk producers from 1983 – 2006. Findings of previous research indicate that dairy market deregulation in the 1980s and 1990s caused lower real milk producer prices, increased uncertainty and higher exit rates in the South African dairy industry. Results of the UCR analysis suggest that EG milk producers were not competitive based on the net local price received for milk but were competitive when dairy cattle trading income was included. This suggests that dairy cattle trading income played an important role in enhancing the profitability of EG dairy enterprises in the study period. Further UCR analysis revealed that the top one-third of EG milk producers were relatively competitive from 1983 – 2006 due to higher real milk prices and lower unit costs. A panel data study of individual EG milk producers could be used to identify other important factors affecting milk producer competitiveness over time.

Keywords: dairy market deregulation; East Griqualand milk producers; competitiveness; unit cost ratio analysis

1. Introduction

Institutions play a crucial role in either enhancing or constraining the competitiveness of firms, sectors and industries within a nation's economy (Ortmann, 2000). With increasing global demand for milk and new dairy products, emphasis on government support policies is diminishing while greater emphasis is being placed on flexibility and innovation to improve dairy industry competitiveness (Suzuki & Kaiser, 2005; Blayney *et al.,* 2006). The South African (SA) dairy industry, previously regulated by the Marketing

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Act of 1937 (Act 27 of 1937) and later by the Marketing Act of 1968 (Act 59 of 1968), was gradually deregulated from the early 1970s, when legislation governing the colouring of margarine changed, and was completely deregulated following the promulgation of the Marketing of Agricultural Products Act of 1996 (Act 47 of 1996).

Edwards and Leibbrandt (1998) note that the effects of deregulation and trade liberalisation on SA wheat producers are dependent upon the competitiveness of domestic wheat production. Similarly, for the dairy industry, it is the ability of domestic milk producers to adjust effectively to institutional change that determines the long-run impact of deregulation. The objectives of this study are to determine how dairy market deregulation, a change in the institutional environment, has affected the competitiveness of commercial milk producers comprising the East Griqualand (EG) study group in KwaZulu-Natal and the Eastern Cape Province of South Africa. Based on a definition by Esterhuizen (2006:89), competitiveness in this study is defined as the ability of a milk producer to achieve sustainable business growth while earning at least the opportunity cost of management. Thus, a producer is considered to be competitive if positive returns to land are earned.

This study uses a microeconomic (firm or producer level) indicator of competitiveness, the Unit Cost Ratio (UCR), developed by Siggel and Cockburn (1995), in preference to more commonly used macroeconomic indicators. This is attributed to the fact that at the microeconomic level the concept of competitiveness focuses on the particular characteristics of each individual producer or firm competing directly for market share (Porter, 2005:43; Siggel, 2006). The UCR method is similar to aspects of the Policy Analysis Matrix (PAM) methodology conceived by Monke and Pearson (1989) but differs from the PAM in that the UCR method measures competitiveness for individual farms and not a representative farm. Financial and production data for individual milk producers from the EG study group were collected and analysed for the years 1983-2006 using three variants (UCR_L, UCR_T, and UCR_N) of the unit cost indicator of domestic competitiveness, UCR_d.

Previous research has suggested that deregulation negatively affected SA milk producers and resulted in major structural change within the SA dairy industry. Structural change in agriculture is characterised by changes in production and consumption patterns, in technology, in size of operation and in the geographic distribution of producers over time (Boehlje, 1999). More specifically, the deregulation process in the SA dairy industry was found to have contributed to increased cost pressure, reduced milk producer profitability (Collins, 1994:58-60) and increased milk producer exit rates and

loss of market share for milk producers (NAMC, 2001:31). The transition from total price control to almost complete privatisation also led to shifts in resource allocation as milk producers attempted to become more efficient (produce at a lower cost per litre) under a new set of production constraints (Collins, 1994:60) and as a result, the geographic distribution of milk production has shifted from predominantly high-cost to low-cost production regions of the country over time (Blignaut, 1999; Coetzee & Maree, 2008). Producers with relatively low milk output and low capital reserves were found to be the most negatively affected by deregulation and milk producer exit rates from this group have been increasing since 1983 (Collins, 1994:60). International studies have found that increased milk producer exit rates are usually accompanied by a consolidation effect as many producers expand their production capacities to take advantage of size economies (Whetton, 2000; Bragg & Dalton, 2004).

According to the definition of competitiveness used in this study, reduced profitability, loss of market share and increased milk producer exit rates suggest that deregulation has negatively affected milk producer competitiveness. Competitiveness, however, also reflects gains in efficiency and international studies have found that deregulation acts to enhance rather than constrain the competitiveness of market participants over time by encouraging innovation (Cantwell, 2005), entrepreneurship (Stiroh & Strahan, 2003) and increased agricultural productivity (Doucouliagos & Hone, 2000; Blayney *et al.*, 2006). This implies that in response to lower producer prices and increased cost pressure brought about by deregulation, milk producers may have become more innovative and efficient over time, producing milk at a lower total cost per litre.

The paper is structured as follows: the next section characterises the dairy industry's policy environment by describing the reasons for past government support of the dairy industry. This section also discusses the findings of previous research on the impacts of deregulation on the SA milk producer. The research methodology is presented in the third section and provides an overview of the Unit Cost Ratio method and the unit cost indicators used in the competitiveness analysis. The results of the competitiveness analysis are presented in the fourth section and the paper ends with conclusions and recommendations.

2. Dairy industry policy environment

Statutory intervention in the SA dairy industry was primarily aimed at improving the industry's market supply, stabilising domestic production and

consumption and protecting domestic producers from foreign competitors (De Swardt, 1983; Groenewald, 2000). Research has shown, however, that the benefits of government support are modest in the long-run, producer incentives are distorted (Pasour & Rucker, 2003:316) and producers are discouraged from pursuing new marketing opportunities (Blayney *et al.,* 2006). Furthermore, taxpayers and consumers ultimately bear the costs of implementing such support programmes through higher food prices while the owners of specialised resources (e.g. land, marketing quotas) are the beneficiaries (Howcroft & Ortmann, 1992; Edwards, 2003; Pasour & Rucker, 2003:308).

Proponents of control argue that features unique to milk production in conjunction with the structure of the milk market necessitate statutory intervention in order to stabilise the industry and ensure orderly marketing (De Swardt, 1983; McKenzie & Nieuwoudt, 1985a). These unique features can be partitioned into milk production features and milk market features.

2.1 Milk production features

Seasonality of milk production: Milk production is generally low in the cold, dry winter months and high during the wet, moderate spring and warm summer months in South Africa. This seasonal variation in production can lead to the generation of seasonal surpluses and shortages of fresh milk and other dairy products resulting in a fluctuating producer price due to the price-inelastic nature of supply and demand for milk (De Swardt, 1983; McKenzie & Nieuwoudt, 1985a; NAMC, 2001:24; Tomek & Robinson, 2003; Suzuki & Kaiser, 2005).

Short-run fixity of resources: Commercial milk production is highly capital intensive and requires the use specialised production inputs (Bragg & Dalton, 2004). Milk is also harvested daily and is highly perishable, locking the producer into a choice of selling, processing or dumping the milk. This makes adjustment to changes in milk prices as well as changes in input prices difficult as in the short-run resources used in the production of milk (e.g., number of cows, pasture type, milking equipment) are fixed (Suzuki & Kaiser, 2005). This increases the risk borne by the milk producer in producing milk and producers may feel government support is necessary to help manage price risks.

Rent-seeking behaviour by producer groups: Pasour and Rucker (2003:49) suggest that statutory intervention in agriculture is better explained by rent-seeking behaviour on the part of producers rather than market failure or inefficiency.

Kassier *et al.* (1992) note that the political power and collective action of commercial agricultural producers ensured the passing of the controversial Marketing Act of 1937; an Act rejected by parliament the previous year. Therefore, milk producers and processors have a vested interest in securing statutory support.

2.2 Milk market features

Price inelasticity of supply and demand for fresh milk: Fresh milk is traditionally considered a basic necessity implying a price-inelastic demand. McKenzie and Nieuwoudt (1985b) estimated the own-price elasticity of demand for fresh milk in South Africa as -0.78 at the retail level and -0.51 at the farm level. Although they could not obtain an estimate of the price elasticity of supply for fresh milk, they estimated the price elasticity of supply for industrial milk as 0.55. They expect fresh milk supply to be more price-inelastic due mainly to asset fixity and health regulation reasons. Proponents of control therefore argue that, due to the price-inelastic nature of demand and supply of fresh milk, price fluctuations without controls would be large and the resulting risk would cause a backward shift in the supply function, thus reducing both consumer and producer surplus (De Swardt, 1983; McKenzie & Nieuwoudt, 1985a).

Oligopsonistic market structure: Due to the perishable nature of milk, its frequency of harvest and the distance from market, milk producers were, in the past, left with few alternative buyers for their milk (Suzuki & Kaiser, 2005). This oligopsonistic (few large buyers, many small sellers) market structure meant that milk producers had reduced bargaining power in the market and could often not negotiate more favourable prices. Government intervention was often called for to correct pricing imbalances between producers and buyers.

Protectionist policies: Suzuki and Kaiser (2005) argue that differences in international competitiveness between countries for dairy products, due to differences in the levels of statutory intervention, necessitate the implementation of import quotas and/or tariffs to protect against dumping and cheap imports. The protection of domestic milk production is often justified by proponents of control on the basis of ensuring national food security (De Swardt, 1983).

2.3 The effects of dairy market deregulation on SA milk producers: previous research

Structural change relates to changes in product characteristics, production and consumption patterns, the size of operation and in the geographic distribution of producers (Boehlje, 1999). The market deregulation process of the SA dairy industry, initiated in 1971, caused major structural change within the industry. According to the NAMC (2001:19), deregulation of the dairy industry began in 1971 with the amendment of legislation allowing the colouring of margarine from white to yellow with the result that margarine became a closer substitute for butter. The amendment lead to a 70% drop in butter sales from 1971 to 1979. From 1979 the deregulation process began to gather momentum until its completion with the promulgation of the Marketing of Agricultural Products Act of 1996 (Act 47 of 1996).

The objectives of the new Act were aimed at enhancing the international competitiveness of SA agriculture via trade reform from an import substitution to an export orientated policy (Vink & Kirsten, 2000). The new Act aimed to: (1) increase market access for all market participants, (2) promote efficiency of the marketing of agricultural products, (3) optimise export earnings from agricultural products, and (4) enhance the viability of the agricultural sector. Other stipulations in the Act were the phasing out of producer dominated control boards by 1 January 1997, bringing to an end significant producer support policies within the SA agricultural sector. The effects of deregulation on milk producers include declining producer prices, loss of market share for fresh milk and other dairy products, increased producer exit rates from the industry, and changes in the geographic distribution of milk production. These effects are discussed below.

2.3.1 Declining producer prices

The implementation of uniform and minimum milk pricing legislation in 1988 enabled producers to negotiate with milk buyers on the price for milk (Collins, 1994:58). However, due to the oligopsonistic (few large buyers, many small sellers) structure of the dairy market at the time, individual producers had low bargaining power relative to milk buyers and were, therefore, often unable to negotiate for more favourable prices. Geographic constraints, limiting the milk buyer alternatives available to producers, further reduced producer bargaining power. Minimum pricing legislation also acted as a stimulus to production and the removal of surplus product was funded indirectly by milk producers through higher levies paid to milk buyers (Collins, 1994:58-60). The impact on national milk producer prices can be seen in Figure 1 where the real national producer price of milk (2000 = 100) declined from R2.00/litre in

1983/84 to a low of R1.22/litre in 1999/00. The real price was R1.44/litre in 2006/07.

Although minimum pricing legislation, implemented in 1988 as part of the deregulation process, gave milk producers relative security against price fluctuations, it also hindered a competitive pricing strategy for fresh milk. Milk producers were unable to price aggressively at levels below the minimum price set by the Dairy Board or its agents and, therefore, could not compete effectively against substitute products (Collins, 1994:59). Substitute products for fresh milk and other dairy products, such as non-dairy blends, whiteners and yellow margarine, have, therefore, been more price flexible and have eroded per capita consumption of fresh milk and dairy products over time. This has ultimately eroded milk producer revenue (McKenzie & Nieuwoudt, 1985a). According to the NAMC (2001:49), the demise of the Dairy Board, which led to the cessation of a successful dairy educational programme (promoting the health benefits of fresh milk), has contributed to lower per capita consumption of fresh milk since 1993.

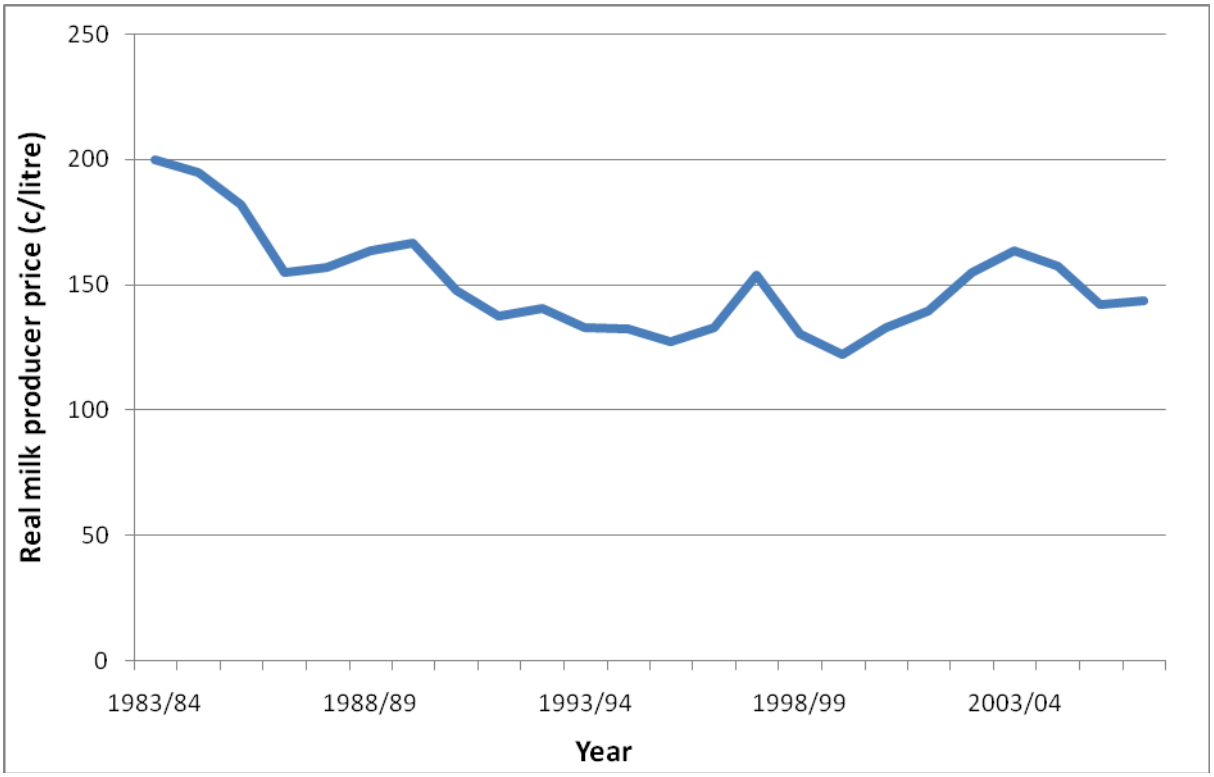

Figure 1: Real milk producer price trend, South Africa, 1983/84 - 2006/07 (2000 = 100)
Source: NDA (2008)

2.3.2 Loss of market share for fresh milk and other dairy products

According to AGROCON (1989:G7), the market share for substitute products such as non-dairy blends and whiteners increased roughly 2% from 1984 to 1987 while the market share for butter declined by 1% over the same period. The reform of South Africa's trade regime from quantitative to tariff control led to increased importation of dairy products (condensed milk, cheese, milk powder) from 1994 resulting in a significant loss in market share for SA milk producers and processors. South Africa's import tariff rates for dairy products are among the lowest in the world and several loopholes in the tariff structure were exploited by importers of dairy products in the late 1990s (AGROCON, 1997:M15). The estimated loss in income to the dairy industry since trade policy reform was estimated at approximately R190 million in 2001 (NAMC, 2001:26). This represents a direct negative impact of 10c/litre on the milk producer price. Further downward pressure was put on milk producer prices in 2004 with the 'dumping'[3] of Irish cheese products. According to Bieldt (2004), the resulting decline in demand for locally manufactured dairy products caused an estimated 15c/litre decrease in the milk producer price between 2004 and 2005.

A contributing factor to the increase in imports of dairy products into South Africa was the overstatement of Minimum Market Access (MMA) commitments (AGROCON, 1997:M14; NAMC, 2001:30). MMA commitments are for products where little or no imports took place in the past. South Africa agreed to meet MMA quota commitments equal to 3% of the domestic consumption of dairy products in the base period (1986 to 1988). Imports were, however, calculated on 3% of the total South African Customs Union (SACU) consumption which included other southern African countries. The resulting overstatement in import quota led to increased imports of dairy products and an estimated 10% loss of market share for SA's milk producers and processors to international competitors (NAMC, 2001:30).

2.3.3 Increased producer exit rates

The period 1983 to 1987 in the SA dairy industry was characterised by numerous amendments to pricing, registration and hygiene legislation as deregulation began to gather momentum. Collins (1994:61) argues that these amendments led to increased uncertainty within the dairy industry, contributing significantly to higher producer exit rates. The reduced profitability of milk production, through declining real producer prices over

[3] *Dumping is said to occur if an exported product is sold in a foreign market at a lower price than is charged in its home market (World Trade Organisation, 2008).*

time, has also been suggested as a possible cause of the increased producer exit rates from the industry (NAMC, 2001:30).

Collins (1994:59) suggested that the passing of stricter parlour regulations in 1988 affected milk producers with a relatively low annual milk output and low capital reserves to a greater extent than larger producers, and estimated that milk producer exit rates from the former group were the highest. Figure 2 shows the trends in milk producer numbers and milk production per producer for South Africa from 1983 to 2004. As Figure 2 illustrates, the declining trend in the number of milk producers has been offset by an increase in the total annual production per producer. Producer exit rates from the dairy industry may also have been influenced by other factors (in addition to declining real producer prices), namely: age of the producer, higher off-farm income opportunities, lower returns relative to variable costs and greater diversification of farm income (Bragg & Dalton, 2004).

The SA government instituted ambitious land reform legislation in 1998 which may have also contributed to increased uncertainty in the SA dairy industry over the security of property rights. This may have also contributed to increased producer exit rates since 1998. Collins (1994:64) concluded that the increasing cost pressure incurred by milk producers and the declining producer's share of the consumer's rand, has necessitated greater efficiency and better management on the part of milk producers to ensure financial survival.

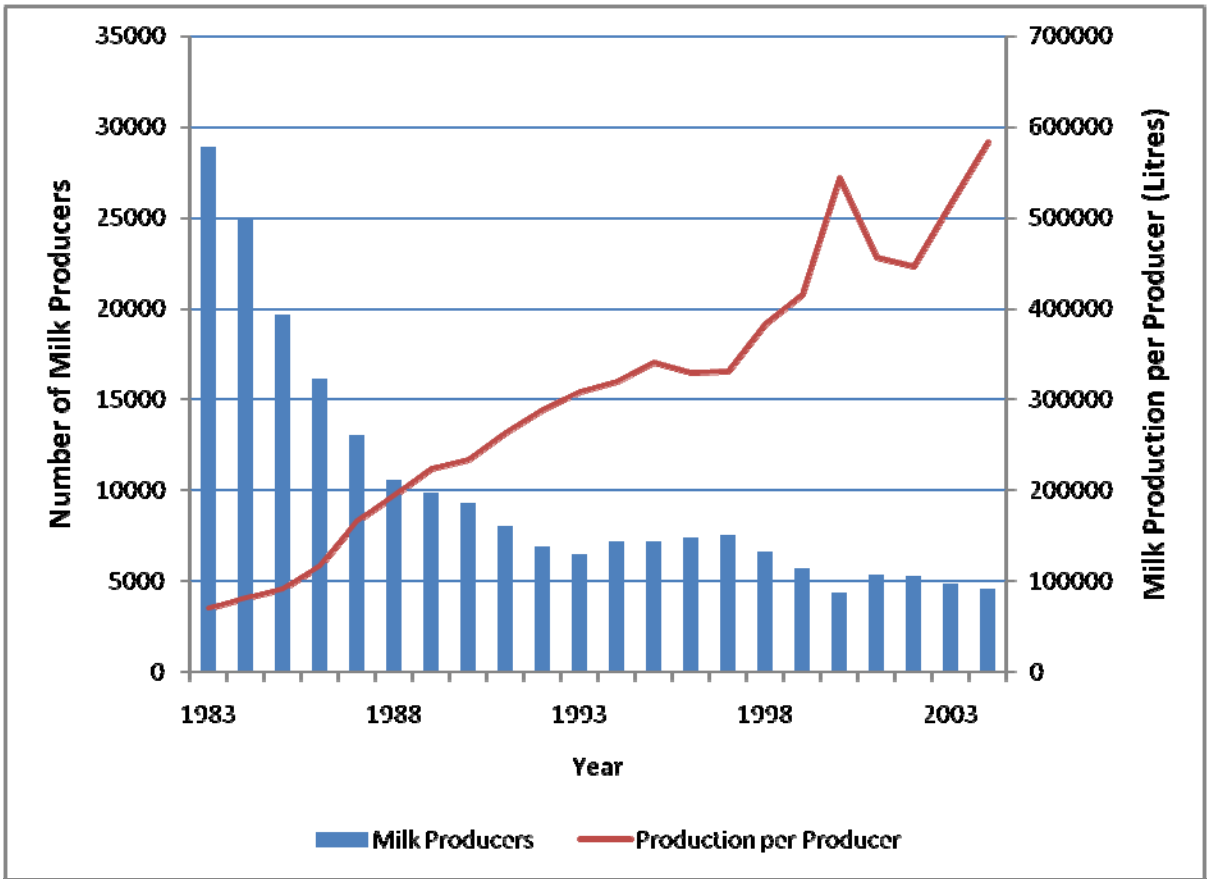

Figure 2: Numbers of milk producers and milk production per producer, South Africa, 1983 - 2004
Source: Collins (1994:61); Maree (2007); NDA (2008)

2.3.4 Changes in geographic distribution of milk production

Since deregulation there has been a significant change in the geographic distribution of milk production in South Africa from traditionally high-cost to low-cost production regions (Blignaut, 1999; Coetzee & Maree, 2008). The shift in the geographic distribution of milk production may have been driven by the declining real milk producer price over time as well as increased competition from international competitors due to trade liberalisation induced by deregulation. The change in the geographic distribution is shown in Table 1. As Table 1 illustrates, the dominant milk producing regions have shifted from the interior of the country to the higher rainfall, coastal regions such as the Western and Eastern Cape provinces and KwaZulu-Natal (Blignaut, 1999; Coetzee & Maree, 2008).

Table 1: Changes in the geographic distribution of milk production, South Africa, 1997 – 2007

Province	% distribution of milk production	
	December 1997	March 2007
Western Cape	**22.9**	**25.3**
Eastern Cape	**13.8**	**21.8**
Northern Cape	1.2	0.7
KwaZulu-Natal	**15.7**	**21.1**
Free State	**18.0**	12.8
North-West	**12.6**	7.1
Gauteng	4.4	3.1
Mpumalanga	11	7.6
Limpopo	0.4	0.5
Total	**100**	**100**

Source: Coetzee and Maree (2008)

The removal of price supports for milk producers brought about by deregulation has encouraged the adoption of lower-cost, pasture-based milk production systems. The coastal areas of South Africa, which have a higher rainfall relative to other areas are, therefore, more suitable for low-cost milk production systems (Blignaut, 1999). Many SA milk producers have successfully adopted the low-cost, pasture-based milk production system practiced in New Zealand in an effort to boost profitability and enhance competitiveness (Bischoff, 2008).

3. Methodology

3.1 Competitiveness defined

Competitiveness is a concept that, despite the widespread acceptance of its importance, is not well understood (Porter, 2005:43). There is general consensus throughout the literature regarding the ambiguity of the precise definition of competitiveness (Ortmann, 2005; Esterhuizen, 2006; Siggel, 2006). The difficulty in defining competitiveness is due to its multi-dimensional applications and interpretations. Some definitions focus on the underlying sources of competitiveness whilst others place more emphasis on the indicators of competitiveness (Ortmann, 2005; Esterhuizen, 2006).

There is, however, general consensus in the literature regarding the following characteristics of competitiveness: competitiveness is a *relative* concept and relates to the *profitable* maintenance and/or gain of domestic and/or international *market share* by a firm, sector or industry. Esterhuizen (2006:89) defined competitiveness as follows: "Competitiveness is the ability of a sector, industry or firm to compete successfully in order to achieve sustainable growth within the global environment while earning at least the opportunity

cost of returns on resources employed". Based on this definition, competitiveness in this study is defined as the ability of a milk producer to cover all dairy enterprise accounting costs plus an opportunity cost of management. Therefore, a producer is considered to be competitive if positive returns to land are earned. Competitiveness in this study is measured at the individual milk producer level using the Unit Cost Ratio (UCR) method.

3.2 Unit cost ratio (UCR) method

The UCR method, developed by Siggel and Cockburn (1995), is a microeconomic method of competitiveness analysis traditionally used to distinguish between comparative advantage and competitiveness. The method uses three variants, UCR_d (domestic competitiveness), UCR_x (international competitiveness) and UCR_s (comparative advantage), of a unit cost indicator derived from Ricardian comparative advantage to determine the sources of competitiveness for a particular firm or industry. Siggel (2006) notes that whereas comparative advantage is the "true" source of competitiveness, the concepts of comparative advantage and competitiveness differ in terms of distortions created by government policies, e.g. protectionist policies, producer price supports, etc. Actual competitiveness is then derived from comparative advantage as well as from the advantage gained by domestic firms from government support policies. The sources of comparative advantage include an abundance of either primary or intermediate inputs, the use of different or superior technology or the production of output on a larger scale (Siggel & Cockburn, 1995; Siggel, 2006).

The unit cost indicator used in this study is based on one of the three unit cost variants, namely the indicator of domestic competitiveness, UCR_d, proposed by Siggel (1997). The domestic unit cost indicator for a particular firm is structured as follows:

$$UCR_d = (TC/VO) = (TC/Q.P_d) \quad (1)$$

Where UCR_d = domestic unit cost ratio
TC = total costs
VO = value of output (total revenue)
Q = quantity of product
P_d = domestic producer price

The UCR_d is a simple ratio of total cost to total revenue for a particular firm and is similar to the Private Profitability (PP) ratio used in the Policy Analysis Matrix (PAM) (Monke & Pearson, 1989). The UCR method is preferred to the

PAM because the UCR method measures the competitiveness of individual producers rather than of a representative farm.

Total costs are costs reported by firms that include tradable inputs, non-tradable inputs, labour costs and capital costs (Siggel, 2006). In the long-term total costs per unit of product, including opportunity costs of all resources, are expected to equal total revenue per unit (product price) (Pasour, 1981; Doll & Orazem, 1984:211-213). In this study, total costs include an opportunity cost of management while the returns to land are regarded as a residual. A UCR_d of less than one indicates that a firm covers all costs, including the opportunity cost of management, and has positive returns to land. Positive returns to land can be a reflection of high factor productivity, low factor or input prices and higher product prices. A UCR_d indicator exceeding one indicates that a firm's returns to land are negative and the firm is, therefore, not locally competitive.

3.3 Data and method of analysis

3.3.1 Data

Individual commercial milk producer data from the East Griqualand (EG) study group were collected for the period 1983 to 2006. East Griqualand encompasses the areas of Kokstad in southern KwaZulu-Natal and Matatiele and Cedarville in the Eastern Cape Province. The area is a summer rainfall region. Over the study period a total of 30 milk producers were members of the EG study group, which was formed with the objective to improve the production and financial performance of its members. This group has received advice from the same consultant throughout the study period. Currently, the study group consists of 23 active milk producers. Since 1983 a number of milk producers have exited the industry. Although membership of the study group has changed over time, the data have been averaged on an annual basis so that trends in real prices and costs, and hence UCR_d, could be identified.

Because of the relatively high availability of land and water, milk production in EG has traditionally been pasture based with varying rates of supplementation of purchased feed (Bischoff, 2008). Many milk producers in the EG study group include other enterprises as a means of portfolio diversification whilst others specialise in dairy production, taking advantage of size and scope economies. Data for each EG milk producer are comprised of financial and production data. If the milk producer had a diversified farm of which a dairy enterprise is a component, fixed or overhead costs were allocated on the basis of gross margin; e.g. if the dairy enterprise contributes

70% to the gross margin, 70% of the fixed costs were allocated to the dairy enterprise (Bischoff, 2008).

Over the study period the composition and size of EG milk producers have changed (see Table 2). Over the period 1985 to 2005 many producers with a relatively low annual milk output have been replaced by fewer, larger producers who have expanded production capacity, taking advantage of size economies where fixed costs are spread over a larger output. Milk buyers, by offering significant price premiums based on milk output, have also encouraged producers to increase herd sizes and milk output.

Total accounting costs, comprised of variable and fixed costs, were recorded for each milk producer. An opportunity cost of management was also included and calculated as 5% of milk revenue, following Calkins and DiPetre (1983:117). Variation in milk revenue will, therefore, result in variation of the opportunity cost of management over time. Thus, milk producers with higher revenue will have a higher opportunity cost of management than producers with lower revenues.

Table 2: Changes in milk production and contribution to total milk production, EG milk producers, 1985; 2005

Annual milk production (litres/year)	Percentage of milk producers (%)		Percentage of milk production (%)	
	1985	2005	1985	2005
1 – 500000	50	9	27	1
500001 - 1500000	33	55	27	34
> 1500001	17	36	46	65
Total	100	100	100	100

Source: Bischoff (2008)

3.3.2 Method of analysis

Three unit cost indicators of domestic competitiveness, namely UCR_L, UCR_T and UCR_N, based on the original UCR_d indicator used by Siggel (1997), were used in this study. These unit cost indicators vary in terms of the domestic price (P_d) used in the calculation of VO or total revenue in equation (1). P_L, used in the calculation of UCR_L, is the net local milk producer price which, prior to 1992 was determined by processor-distributors who acted as agents for the Milk Board. Premiums have always been paid to milk producers on the basis of milk quality (reflected by the milk solid content, i.e. butterfat and protein content) but prior to 1992, milk transport was paid by the milk producer. Since 1992 the pricing policy of milk buyers has varied substantially between buyers and numerous factors such as seasonal production

fluctuations, the bacterial content of the milk (reflected by the somatic cell count), the volume of milk produced and the distance from the milk buyer depot are taken into account when producer prices are determined. The price received by each milk producer price is, therefore, net of transport costs and other levies and dependent on quality, volume and locational factors.

P_T, used in the calculation of UCR_T, is the net local milk producer price, P_L, plus dairy cattle trading income[4]. Dairy cattle trading income can often play an important role in the profitability of the dairy enterprise (Broom, 2008). P_N, used in the calculation of UCR_N, is the national milk producer price (net of transport costs) obtained from the NDA (2008). P_N is a standard milk producer price and removes locational and other differences between producers.

4. Results

The results of the UCR analysis for different time periods are summarised in Table 3. The number of milk producers varied over time and the low number of producers from 1983 to 1987 was due to a lack of sufficient data and data collection problems. Competitiveness is a relative and dynamic concept and the results presented in Table 3 reflect average milk producer competitiveness over time under prevailing government policies. For example, a milk producer who was competitive in 1983 may not be considered competitive in 2006.

4.1 Unit cost ratio based on P_L (UCR_L)

The UCR_L shows the relative competitiveness of an average milk producer over time based on the net local milk producer price P_L. The mean UCR_L indicator for the EG group fluctuated around one between 1983 and 2006. During this period, the average EG milk producer was earning negative returns to land based on the net price received for milk. Between 1988 and 1997 the mean UCR_L were 1.197 and 1.153, showing a decline in competitiveness from 1983. The real net local producer price (2000 = 100), P_L, declined by 19% from R2.04 in 1983 to R1.65 in 1997 while real average total costs per litre declined by only 13% over the same period. The decline in relative competitiveness can, therefore, be attributed to a larger decline in real price relative to real total costs. Relative competitiveness improved in the 1998 to 2006 period but returns to land were still negative.

[4] *Trading income = (livestock sales + herd closing value) – (livestock purchases + herd opening value)*

Table 3: Results of UCR analysis for EG milk producers, 1983 – 2006

	Mean UCR_d		
Years	**UCR_L**	**UCR_T**	**UCR_N**
1983 – 1987 (n = 5)	1.050 (0.120)*	0.938 (0.074)	1.139 (0.094)
1988 – 1992 (n = 8)	1.197 (0.060)	1.031 (0.062)	1.240 (0.086)
1993 – 1997 (n = 14)	1.153 (0.054)	1.015 (0.040)	1.203 (0.060)
1998 – 2002 (n = 16)	1.083 (0.062)	0.982 (0.044)	1.056 (0.079)
2003 – 2006 (n = 10)	1.061 (0.047)	0.956 (0.043)	1.005 (0.046)

**Figures in parentheses show the standard deviation of UCR*

Responses to rising purchased feed (maize) prices relative to milk prices over time (Collins, 1994:63) are evident in the substitution of own-produced forage crops for purchased feed by EG milk producers. For example, the average percentage of purchased feed costs to total milk revenue for the EG milk producers declined from 28.6% in 1983 to 22.7% in 1988 while the average percentage of own-produced forage costs increased from 9.3% to 15.8% in the same period. The relatively high standard deviation of UCR_L of 0.120 in the period 1983 to 1987 indicates that there was a relatively high variation among this (small) group of producers in terms of their returns to land. The standard deviation decreased to 0.047 in the period 2003 to 2006 indicating that the variation in returns to land among milk producers decreased over time.

4.2 Unit cost ratio based on P_T (UCR_T)

The UCR_T shows the relative competitiveness of an average milk producer over time based on the net total price, P_T, which is the net local price, P_L, plus dairy cattle trading income. Milk producers commonly use trading income to supplement milk income. The inclusion of trading income impacted positively on the relative competitiveness of the average EG milk producer when compared to the UCR_L measure. Returns to land were, however, still negative from 1988 to 1997 as the mean UCR_T was greater than one. Relative competitiveness, however, improved from 1998 to 2006.

The contribution of trading income to P_T increased from 8.91% in 1983 to 15.6% in 1989. This may be further evidence of the cost/milk price squeeze that milk producers were experiencing in the late 1980s, with producers relying more on trading income to survive. The average contribution of trading income to the net total price declined from 12.1% in the period 1983 to 1997 to 9.8% in the period 1998 to 2006. This suggests that gains in

competitiveness since 1998 were derived from growth in the average real net local price, P_L, relative to the average real total costs per litre for this period.

4.3 Unit cost ratio based on P_N (UCR_N)

The UCR_N shows the relative competitiveness of the average EG milk producer over time based on the national price (net of transport costs), P_N, as reported by the National Department of Agriculture (NDA, 2008). The results indicate that the average EG milk producer would be earning negative returns to land from 1983 to 2002 if P_N was received for milk. Relative competitiveness declined from 1983 to 1992 and improved slightly from 1993 to 1997. The decline in relative competitiveness in the former period can, firstly, be attributed to a decline in real P_N, which fell from R2.00/litre to R1.41/litre from 1983 to 1992. Secondly, real average total costs per litre for the EG group have, in the past, been relatively high and have not declined at the same rate as P_N. For the period 1983 to 1992 the real total cost per litre averaged R1.97 compared with R1.51 for the period 1993 to 2006. The substitution of own-produced forage for purchased feed has been an important factor in reducing the average total cost per litre for the EG group over time. Relative competitiveness improved from 1998 to 2006 with a UCR_N of 1.005 for the period 2003 to 2006.

4.4 Categorisation of EG milk producers based on UCR_T

The EG milk producers were divided into top one-third and bottom one-third categories based on their individual UCR_T indicators from 1983 to 2006. This was done to investigate the impacts of deregulation on different groups of milk producers and to explain why deregulation affects a milk producer more than others. The results for the UCR_T analysis based on the two categories are presented in Table 4.

Table 4: Mean UCR_T indicator results for two categories of EG milk producers, 1983 – 2006

Years	UCR_T	
	Top 1/3	**Bottom 1/3**
1983 – 1987	0.855 (0.058)[a]	1.029** (0.086)
1988 – 1992	0.952 (0.033)	1.142** (0.141)
1993 – 1997	0.912 (0.037)	1.140*** (0.072)
1998 – 2002	0.881 (0.051)	1.095*** (0.054)
2003 – 2006	0.834 (0.055)	1.054*** (0.063)

[a] *Figures in parentheses show the standard deviation of UCR_T*
,* *denote significant differences between the means at the 5% and 1% levels of probability, respectively (see Steel and Torrie, 1980:95)*

As Table 4 shows, the UCR_T values were significantly different for the two categories of milk producers indicating that market deregulation impacted differently on the competitiveness of milk producers. Appendix A shows the average real P_L and real total costs per litre for EG milk producers in the top and bottom one-third categories from 1983 to 2006. EG milk producers in the top one-third category were able to remain relatively competitive from 1983 to 2002 despite declining national milk producer prices over this period by consistently achieving a higher real P_L and producing at a lower real cost than producers in the bottom one-third. Higher real prices can reflect higher product quality and/or locational advantage (lower transport costs). Lower real costs can reflect the use of superior or cost-reducing technologies and/or size economies. Real total costs per litre for the top one-third producers declined steadily from 1983 to 2002 and rose on average by 6% in the period 2003 to 2006 relative to the period 1998 to 2002. Returns to land over this period remained positive as the increase in average real total costs was offset by a larger increase in the average real producer price, P_L, of 17%.

5. Conclusions and recommendations

Dairy market deregulation, which began in 1971, was initially a gradual process but gained momentum in the 1980s. According to findings from previous research, the effects of amendments to legislation in the 1980s were increased uncertainty, reduced milk producer profitability and increased exit rates of producers from the industry. Reduced profitability nationally, indicated by declining real national milk producer prices from 1983 to 1992, is consistent with the results of the UCR analysis of the EG study group. From 1993 to 1997 real national and EG milk producer prices remained relatively stable despite the increased importation of dairy products from international

competitors from 1994. East Griqualand and national real milk producer prices improved from 1998 to 2006 and EG milk producers were also able to reduce average real total costs per litre in the period 1983 to 2002.

The UCR_L analysis showed that the average EG milk producer did not cover all costs, including an opportunity cost of management, based on the net local price, P_L, received for milk for all periods. Based on the net total price, P_T, which included dairy cattle trading income, the competitiveness of the average milk producer improved. This suggests that during periods of relatively low real milk prices and rising costs trading income plays an important role in enhancing the profitability of a dairy enterprise. The UCR_N analysis based on the national milk producer price, P_N, showed that the average EG milk producer received a real milk price above the national average over the study period.

Market deregulation impacted differently on the relative competitiveness of EG milk producers. Producers in the top one-third category, based on UCR_T, were able to remain competitive and earned positive returns to land despite declining real local producer prices from 1983 to 2002. Milk producers in the bottom one-third category were not competitive over the study period and the differences in relative competitiveness between the top and bottom one-third categories were statistically significant. Real price differences between the two producer categories can be attributed to milk quality differences, milk volume produced and/or locational (dis)advantages. Real cost differences can be attributed to the use of superior or cost reducing technologies and/or size economies.

The overall impact of market deregulation on the competitiveness of EG milk producers can be partitioned into two distinct phases, namely: an initial negative phase from 1983 to 1997 and a positive phase from 1998 to 2006. The initial negative phase, during which EG milk producers were not competitive (based on UCR_T), can be attributed to declining real net local prices relative to real total costs over the period 1983 to 1997. Real local net producer prices were initially high in 1983 but declined steadily towards 1997; during this period the net local producer price, P_L, was determined by local milk buyers in conjunction with the Milk Board. Price distortions as a result of statutory intervention may have exacerbated the seasonal milk production patterns to the detriment of EG milk producers. The positive phase from 1998 to 2006, during which EG milk producers were relatively competitive (based on UCR_T), can be attributed primarily to declining real total costs and improving real local milk prices. Declining real costs, in response to declining real milk prices from 1983 to 1997, could have been due to the use of superior

technologies, cost-reducing feeding regimes (e.g. relative greater use of pastures), and size economies as EG milk producers have expanded their production capacity and herd sizes.

This analysis also shows that although there may be correlation between deregulatory changes in the dairy industry over the study period and changes in the relative competitiveness of EG milk producer, it is difficult to attribute changes in competitiveness at the producer-level exclusively to a macroeconomic change such as market deregulation. Further investigation into other factors affecting EG milk producer competitiveness will be conducted by analysing panel data of EG milk producers over the study period. Results of the panel data analysis may also reveal more specific reasons for the improvement in relative competitiveness for the average EG milk producer from 1998 to 2006. A shortcoming of this analysis was the lack of sufficient data as well as other data collection problems, which were particularly prevalent for the years 1983 to 1987. Further analysis aims to provide recommendations on how EG milk producer competitiveness can be improved.

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Appendix A

Average real net local milk producer price (P_L) and average real total costs per litre of the top and bottom one-third of East Griqualand milk producers, 1983 – 2006 (2000 = 100)

	Top one-third		Bottom one-third		
Period	**Real producer price (R/litre)**	**Real total costs* (R/litre)**	**Real producer price (R/litre)**	**Real total costs* (R/litre)**	**Average real national producer price (R/litre)**
1983 – 1987	2.01	1.99	1.77	1.97	1.66
1988 – 1992	1.60	1.78	1.58	2.02	1.35
1993 – 1997	1.56	1.57	1.38	1.77	1.23
1998 – 2002	1.34	1.31	1.30	1.53	1.28
2003 – 2006	1.57	1.39	1.49	1.69	1.52

** includes opportunity cost of management*