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The sensitivity of the South African industrial sector's electricity consumption to electricity price fluctuations

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Abstract
Numerous studies assume that the price elasticity of electricity demand remains constant through the years. This, in turn, means that these studies assume that industrial consumers react in the same way to price fluctuations regardless of the actual price level. This paper proposes that the price elasticity of industrial electricity demand varies over time. The Kalman filter methodology is employed in an effort to provide policy-makers with more information on the behaviour of the industrial sector with regards to electricity price changes, focusing on the period 1970 to 2007. Other factors affecting electricity consumption, such as real output and employment, are also captured. The findings of this paper show that price sensitivity has changed since the 1970s. It has decreased in absolute values from -1 in 1980 to -0.953 in 1990 and then stabilised at approximately -0.95 which indicates that the industrial sector has experienced an inelastic demand. In other words, the behaviour of industrial consumers did not vary significantly during the 2000s. In the long run and as the prices increase, probably reaching the levels of the 1970s or even before, the industrial sector's behaviour might change and the elasticity might end up at levels higher than one (elastic).

Keywords: electricity consumption; Kalman filter; price elasticity; industrial sector

1. Introduction

In South Africa, choosing the correct and appropriate electricity price regime has been under discussion during the last decade. During March 2012, the National Energy Regulator South Africa (NERSA) re-evaluated and reduced the agreed rate of increase of the electricity price for 2012. Eskom has also expressed its intentions for further application on price rises for two main reasons: first, Eskom argues that the current prices are not cost-reflective, and second, its capacity expansion plans include investing in two new power plants that will increase the company's operating costs. Before the next electricity price restructure, it is imperative for policy-makers to understand, and in a way, 'predict' the reactions of consumers to price changes. Even more important, the national electricity consumption trends do not necessarily represent each sector's individual behaviour. Different price structures as well as different electricity profiles are the main reasons why different economic sectors should be examined separately and treated accordingly.

Energy (and more specifically electricity) plays an essential role in the production capacity of a country. It is a crucial role, specifically for the manufacturing sector where energy is considered an irreplaceable input. In South Africa, the industrial sector is responsible for an average of 47% of the total electricity consumption (DoE, 2009), which makes this sector one of the most important ones from an energy consumption point of view. Ziramba (2009) studied the energy consumption of the industrial sector in South Africa and its interaction with other variables such as industrial output and employment (but not electricity prices). More recently, Inglesi-Lotz and Blignaut (2011a) found that, among various economic sectors such as agriculture and transport, the industrial sector was the only one whose electricity consumption behaviour is sensitive to price fluctuations during the period 1993 to 2006.

Following Inglesi-Lotz (2011), this paper proposes that the sensitivity of the industrial sector's electricity consumption to price fluctuations (price elasticity) has been changing through the years. As Inglesi-Lotz (2011) also points out, 'focus on variation is more important than only examining the level of change' – especially for the South African case after the price restructuring of 2009/10. The fluctuations are so drastic that one has to take into account changes in behaviour. Thus, the purpose of this paper is to estimate the time-varying sensitivity of the industrial sector's electricity consumption to price changes, using the Kalman filter econometric methodology for the period 1970 to 2007. (See Section 3 for a discussion on the reasons for the selection of the time period).

This paper combines and extends the results by Inglesi-Lotz (2011) and Inglesi-Lotz and Blignaut (2011a) in an effort to provide policy-makers with more information on the behaviour of the industrial sector with regards to electricity price changes. The findings will assist regulators and policy-makers in future decisions on price changes, a topic extremely relevant and crucial to the current South African case.

This paper is structured as follows: Section 2 provides a brief overview of studies that deal with the industrial sector's energy or electricity consumption, as well as a summary of the South African studies that deal with electricity prices and their effect on the economy either in its entirety or specific sectors. Section 3 presents the methodology and the data used. Section 4 presents the empirical results, and Section 5 summarises the findings and concludes by discussing some possible policy implications.

2. Literature review

During the last few decades, literature has paid special attention to price elasticities of energy demand. A possible reason for this is concerns regarding the environmental effects of the rising energy demand internationally, and the ever-increasing need to find appropriate instruments (if existing) to control it. The industrial sector, specifically, attracted more attention since it currently consumes approximately 37% of the world's total delivered energy (Abdelaziz *et al*., 2011).

Many studies have been conducted on the energy (electricity) demand of the industrial sectors in various countries within different geographical regions and with different economic backgrounds. These studies also use numerous methods. Different variables are used as factors other than prices affecting the demand depending on the specific region and the time period. But all-in-all, the major determinants of the industrial sector's energy (electricity) demand in the majority of the studies are output, price of electricity and employment (Al-Ghandoor *et al*., 2008; Jamil & Ahmad, 2011).

Table 1 presents a summary of international and local studies and their findings (in chronological order) that deal with the industrial energy (electricity) demand. This collection of studies, although by no means exhaustive of the literature, is indicative of the focus on a variety of countries (developed and developing) for different time periods. A variety of numerical estimations of the price elasticity, depending on the country and more importantly the period of the sample, is also observed.

For South Africa, only one study that sheds some light on the reaction of the industrial sector (among others) to the changes of prices is identified (Inglesi-Lotz & Blignaut, 2011a). Ziramba (2009) also studies the industrial sector's electricity demand reactions but excluded price from the factors affecting it. Another recent study by Inglesi-Lotz and Blignaut (2011b) looks at the different economic sectors and the factors that affect their increasing electricity consumption. However, due the nature of the method used (decomposition techniques), the effects of price fluctuations were not studied. Other studies also look at electricity demand trends in South Africa (Odhiambo, 2009; Amusa *et al.,* 2010; Inglesi, 2010; Inglesi-Lotz, 2011) but focus on the aggregate demand of the

Table 1: Summary of selected international and local studies on price elasticity of energy (electricity) demand in the industrial sector

Authors	*Country/region*	*Sector*	*Price elasticity*
Pindcyck (1979)	Group of countries	Industrial & commercial	-0.07 to -0.16
Lynk (1989)	UK	Industrial	-0.69
Caloghirou *et al.* (1997)	Greece	Industrial	-0.90
Beenstock *et al*. (1999)	Israel	Industrial	0.123
Hunt *et al*. (2003)	UK	Manufacturing	-0.20
or 0.16 to 0.323			
Kamerschen & Porter (2004)	Oman	Industrial	-0.34 to -0.55
Dimitropoulos *et al. (*2005)	UK	Manufacturing	-0.159
Roy *et al.* (2006)	Country panel	Industrial	-0.80 to -1.76
Enevoldsen *et al*. (2007)	Denmark, Norway and Sweden	Industrial	-0.35 to -0.44
Agnolucci (2007)	UK	Industrial	-0.60
Agnolucci (2009)	UK and Germany	Industrial	-0.64
Inglesi-Lotz and Blignaut (2011a)	South Africa	Industrial	-0.869
He *et al.* (2011)	China	Industrial & commercial	-0.018

economy. Furthermore, Ziramba (2009) finds that price was an insignificant factor for the residential demand of electricity in South Africa for the period 1978–2005.

3. Methodology and data

3.1 Econometric method

Econometric methods used in the analysis of energy vary in complexity from simple to relatively complicated and have been applied to temporal, spatial and sectoral data (Greening *et al.*, 2007). More specifically, co-integration techniques have been used internationally (Engle & Granger, 1987; Johansen, 1991; Hendry and Juselius, 2000; Hendry and Juselius, 2001) and locally (Inglesi, 2010) to estimate the determinants of energy and electricity consumption. However, the common constraint in all these studies is the assumption that the relationship between electricity prices and consumption has remained constant through the years. Consequently, to take this a step further, Inglesi-Lotz (2011) employs the Kalman filter technique and proposes that price elasticity has evolved during the years and should not be treated as stable. Therefore, an average elasticity through the years is not assumed and different behaviour from electricity consumers under various price regimes and during various time periods is shown with this method.

It is therefore important to test for the general stability of parameters before selecting the Kalman filter as the method of preference. To test the stability of parameters, Hansen (1992) proposes a version of past approaches to cover general models with stochastic and deterministic trends. In this paper, this test is used to statistically confirm or reject the assumption of time-varying price elasticity before proceeding with the estimation.

There are two main types of models that can be represented by the Kalman filter: a) unobservable components models; and b) time-varying parameter models (Cuthbertson *et al.,* 1992). In this study, the state-space model is applied with stochastically time-varying parameters to a linear regression in which coefficients representing elasticities are allowed to change over time.

Firstly,[1] the formal representation of a dynamic system written in state-space form suitable for the Kalman filter should be described. The following system of equations presents the state-space model of the dynamics of a n x 1 vector, y_t.

Observation (or measurement) equation:

$$y_t = Ax_t + H\xi_t + w_t \quad (1)$$

State (or transition) equation:

$$\xi_{t+1} = F\xi_t + v_{t+1} \quad (2)$$

where A, H and F are matrices of parameters of dimension (n x k), (n x r), (r x r), respectively, and x_t is a (k x 1) vector of exogenous or predetermined variables. ξ_t is a (r x 1) vector of possibly unobserved state variables, known as the state vector.

In the observation equation, the factor x_t is considered to be predetermined or exogenous which does not provide information about ξ_{t+s} or w_{t+s} for s = 0,1,2,… beyond what is given by the sequence $y_{t-1}, y_{t-2},\ldots,y_1$. Thus, x_t could include lagged values of y or variables which are uncorrelated with ξ_T and w_T for all T.

The overall system of equations is used to explain a finite series of observations $\{y_1, y_2,\ldots,y_T\}$ for which assumptions about the initial value of the state vector ξ_t are needed. With the assumption that the parameter matrices (F, Q, A, H or R) are functions of time, then the state-space representation (equations (1) and (2)) become:

$$y_t = a(x_t) + [H(x_t)]'\, \xi_t + w_t \quad (3)$$

$$\xi_{t+1} = F(x_t)\xi_t + v_{t+1} \quad (4)$$

Where F(xt) is a (r x r) matrix whose elements are functions of x_t; $a(x_t)$is a (n x 1) vector-valued function; and $H(x_t)$ is a (r x n) matrix –valued function.

Equations (3) and (4) allow for stochastically varying parameters, but are more restrictive in the sense that a Gaussian distribution is assumed.

With regards to the specific application to the electricity model of this paper, the dependent variable is the electricity consumption of the industrial sector (cons) while standard variables used in the international and local literature (Ziramba, 2009; Inglesi, 2010; Nakajima & Hamori, 2010; Dilaver & Hunt, 2010) are considered as independent: price of electricity (p), real output of the industrial sector (y) and employment (n). All the variables are in natural log denoted by l.

$$lcons = a_0 + a_1 l_p + a_2 ly + a_3 ln + \varepsilon_t \quad (5)$$

In equation (5), all the parameters α are considered constant over time. However, after using the Hansen (1992) test, they will either be identified as time-varying or remain constant. An indication of this will be given even before the statistical test by the graphical representation of the data. The time-varying parameters will then also have a suffix t to denote the fluctuations over time to be estimated.

3.2 Data

Local sources of data were primarily used for this exercise. Average electricity consumption is derived from the following different sources: *South African Energy Statistics 1950–1989* by the National Energy Council (NEC, 1990) for 1970–1989 and the *Aggregate Energy Balances* by the Department of Energy (DoE, various issues). The series for average nominal prices of electricity for the industrial sector is obtained from the *Energy Price Report 2009* also by the Department of Energy (DoE, 2009). Finally, the data series for the real economic output and employment of the industrial sector is obtained from the *Quantec databases* (Quantec, n.d.). The economic output figures are presented in real terms with 2005 being the base year. In order to transform, the nominal prices of electricity into constant with 2005 base year, the Consumer Price Index (CPI) figures from *StatsSA* is employed.

The electricity consumption was measured in kWh; the electricity prices (after the transformation) in South African Rand (ZAR) cents/ kWh (constant prices 2005); the economic output of the industrial sector in ZAR (constant prices 2005) and the employment in absolute number of employees.

Table 2 summarises the descriptive statistics of all the variables (in their linearised version) used in the analysis. These primary statistics are only presented as an indication of the nature of the raw data.

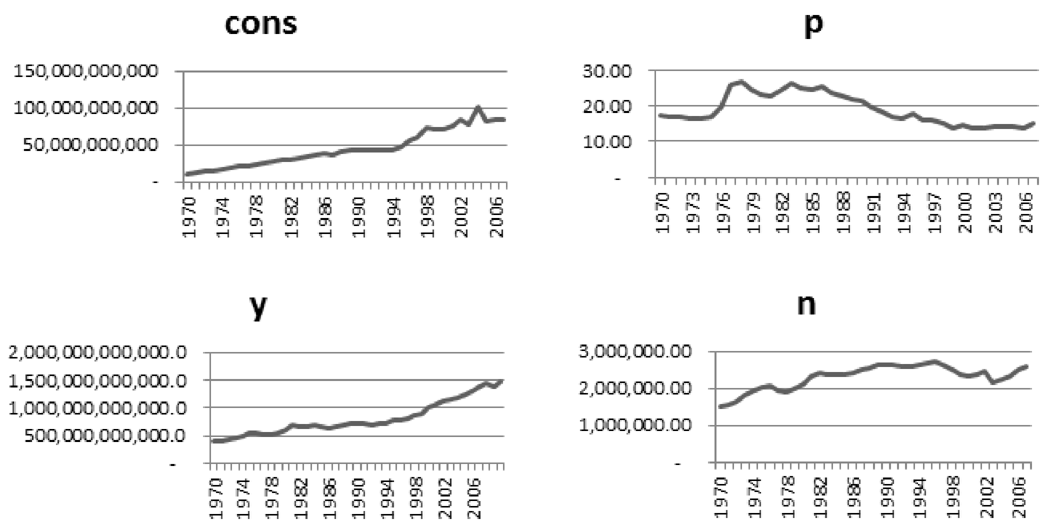
Figure 1 illustrates electricity consumption and prices as well as the real economic output and employment of the South African industrial sector for the period 1970–2008. The industrial economic output and its electricity consumption showed an upward trend for the entire period examined. This trend became more intense during the 1990s, when the sanctions against South Africa were lifted and the country's trade opened to the rest of the world. Since then the real economic production of the country rose with increasing rates to match the rising electricity consumption of the sector.

Employment showed a general upward trend until the end of approximately the 1980s and then its variation relatively stabilised until the end of the sample. This can be attributed to the industrialisation of the economy. It can be argued that the growth of the industrial sector during this period led to the substitution of labour with capital, especially after opening to international markets and gaining opportunities to import capital infrastructure and know-how. Although this was indeed a reality, the labour market also opened to all previously disadvantaged South Africans and, consequently, more employment opportunities were available. The lower labour costs of unskilled or semi-skilled workers also played a role in the higher number of people employed. From the graphical representation of employment in the industrial sector, it can be assumed that these two factors drove employment in opposite directions and, especially for the period 1985 to the beginning of 2000s, the range of employment change was relatively marginal (2.4–2.8 million). Overall, the increasing trend matches the trend of the output of the industrial sector and the electricity consumed.

Electricity prices increased drastically during the first half of the 1970s, reaching a peak in the beginning of the 1980s. However, prices started declining rapidly from the 1980s until the 2000s. Looking at the steep increase in prices from 1975 to 1976, it was decided to proceed with an estimation excluding the first five years of the sample and only start from 1976. Also, data for most of the variables is available until 2010/11; however, the latest information on sectoral electricity consumption from the *Energy Balances* was released in 2009 and on prices for 2008/09. Usually, the latest reports of energy data are re-evaluated as soon as more information becomes available and hence, the latest most accurate year of energy data is 2007. Also, the international crisis affected the output of the economy after 2008/09 and the decision was made to

Table 2: Data descriptive statistics
Source: DoE (various issues), DoE (2009), Quantec (n.d.)

Variable	*Electricity consumption of the industrial sector*	*Average electricity price of industrial sector*	*Real economic output of industrial sector*	*Employment of the industrial sector*
Unit of measurement	*kWh (in natural log)*	*ZAR cents per kWh (in natural log)*	*ZAR (in natural log)*	*Number (in natural log)*
Mean	24.38	2.92	34.20	14.64
Median	24.46	2.85	34.18	14.69
Maximum	25.34	3.28	34.86	14.81
Minimum	23.16	2.61	33.64	14.21
Std. dev.	0.59	0.22	0.33	0.15
Skewness	-0.31	0.21	0.29	-1.17
Kurtosis	2.22	1.60	2.41	3.60
Jarque-Bera	1.55	3.41	1.10	9.20
Probability	0.46	0.18	0.58	0.01
Sum	926.36	110.83	1299.68	556.28
Sum sq.dev.	12.91	1.86	3.91	0.88
Observations	38	38	38	38



Note: Electricity consumption (cons) is measured in kWh; employment (n) in numbers; electricity prices (p) in ZAR cents /kWh; and real output (y) in ZAR.

Figure 1: Electricity consumption (cons), employment (n), electricity prices (p) and eeal output (y) of the South African industrial sector (1970–2007)

Source: DoE (various issues), DoE (2009), Quantec databases (n.d.)

exclude the years after 2008 from the estimated sample. In the future, when information becomes available for the years after the crisis, this period can be treated as a structural break in any economic analysis of data.

From Figure 1, it can also be observed that the overall real output and employment both had a constant positive correlation with electricity consumption; while the price variation is more intense over the years and might show a more changeable relationship with electricity consumption on an annual basis. These observations might be an indication of the *a priori* expectations of the Hansen test results.

4. Empirical results

As discussed in Section 3, before proceeding with the estimation using the Kalman filter, the Hansen test is performed to either confirm or reject the parameter instability. From the graphical representation of the data, a more stable coefficient is expected for output and employment while the relationship between price and consumption of electricity is expected to vary over the years, represented in an unstable parameter. The null hypothesis of the Hansen test is parameter stability and an Lc statistic is used (Lagrange Multiplier tests family). If even one of the coefficients is confirmed statistically to be unstable, the Kalman filter will produce better results than a least squares estimation.

Table 3 presents the results of the Hansen test. The test statistic for output and employment is 0.192 with p-value higher than 0.2. Because the p-value is greater than the 10% level of significance, the null hypothesis of parameter stability cannot be rejected. Hence, the parameters for output and employment are found to be constant. The results of the Hansen test for the price coefficient indicated the test statistic is 0.4 and its p-value is 0.077. Since the p-value is less than the 10% level of significance, the null hypothesis of the test can be rejected. The conclusion is that the price coefficient is not constant through the years. Overall, based on the Hansen test results, the coefficients for output and employment should be considered as constant while the coefficient for price should be considered as time-varying in the Kalman filter estimation.

Table 3: Hansen test results for parameter stability

	Lc statistic	*p-value*	*Conclusion*
ly, ln	0.192	>0.2	The null hypothesis (H_0: parameter stability) cannot be rejected **The parameters are constant**
lp	0.400	0.077	The null hypothesis (H_0: parameter stability) can be rejected **Parameter is not constant**

Note: ly denotes the natural logarithm of real output (y); ln denotes the natural logarithm of employment (n); and lp denotes the natural logarithm of electricity prices (p)

Table 4 presents the Kalman filter estimation results, and c(1) and c(2) (constant coefficients) show the output and employment coefficients respectively, while c(3) is the constant parameter of the equation. The coefficients are both positive and statistically significant: any positive change in the output or employment will result in an increase in electricity consumption.

Table 4: Kalman filter estimation results

Space model		
Sample		*1976-2007**
Included observations		32
Number of iterations to convergence		9
Variables	*Estimated coefficients*	*p-values*
c(1) (output coefficient)	0.690	0.000
c(2) (employment coefficient)	0.252	0.061
c(3)	-4.065	0.000
	Final state	*p-values*
sv1 (price coefficient)	-0.952	0.000
Goodness of fit		
Log likelihood	8.502	
Akaike info criterion	-0.344	
Schwarz criterion	-0.206	
Hannan-Quinn criterion	-0.298	

* As can be seen, the sample was reduced to start from 1976 and not 1970. This was needed due to the fact that the sharp increase in the beginning of the 1970s might be due to a structural break or an anomaly of the data. Hence, the focus of the analysis is from the middle of 1970s.

Sv1 is the average of the price elasticity over the period 1976–2007 and it is negative as expected. (Law of demand: the higher the price of a good, the lower the quantity consumed of the good). Overall it is statistically significant with a p-value of zero. Both output and price coefficients are very close to the average coefficients reported in Inglesi-Lotz and Blignaut (2011) for the industrial sector. The price coefficient for the examined period (1993–2006) was -0.869 (here, -0.952) and the output elasticity was 0.712 (here, 0.690).

Figure 2 illustrates the evolution of price elasticity. In the beginning of 1980s, price elasticity of electricity demand was close to unit elastic. Since then, it has decreased in absolute values from -1 in 1980 to -0.953 in 1990. Thereafter, the elasticity stabilised at approximately -0.95 indicating that the industrial sector has experienced an inelastic demand. In other words, the behaviour of the industrial consumers did not vary significantly during the 2000s. That might explain why, in some studies, researchers assume that price has not played a significant role in the fluctuations of electricity consumption in the industrial sector and therefore not include prices in the estimations, for example, Ziramba (2009).

This result also confirms the main conclusion of Inglesi-Lotz (2011) that the sensitivity of consumers to price fluctuations became smaller in absolute terms, while the real prices of electricity declined over the last half of the sample examined. It can be seen in Figure 3 that, from 1977 until the beginning of 1990s, the electricity prices decreased in real terms and the price elasticity became lower in absolute terms. However, from the 1990s until the end of the sample period, prices stabilised at much lower rates than in the 1970s and 1980s, and the sensitivity of the consumers did not change drastically.

5. Conclusion

As the main electricity user, the industrial sector of South African plays an important role in the path of electricity consumption. Knowing and understand-

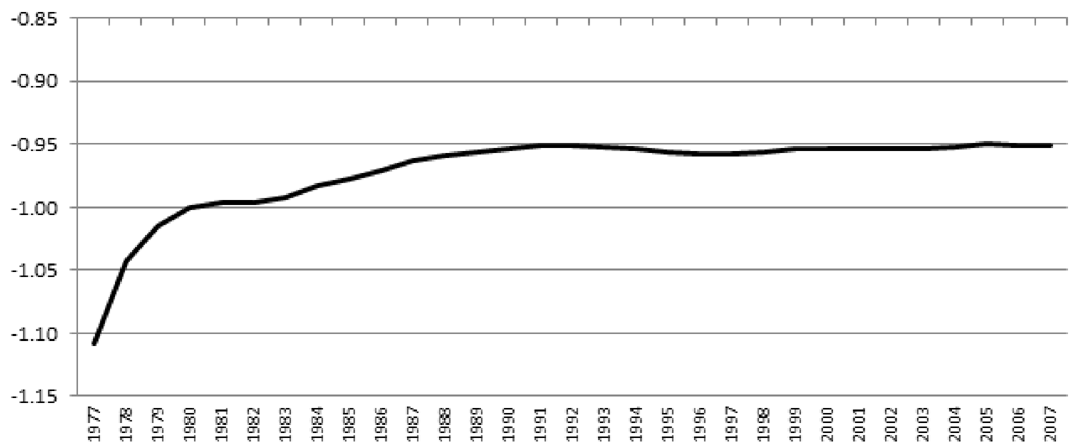


Figure 2: Estimated price elasticity from 1976 to 2007

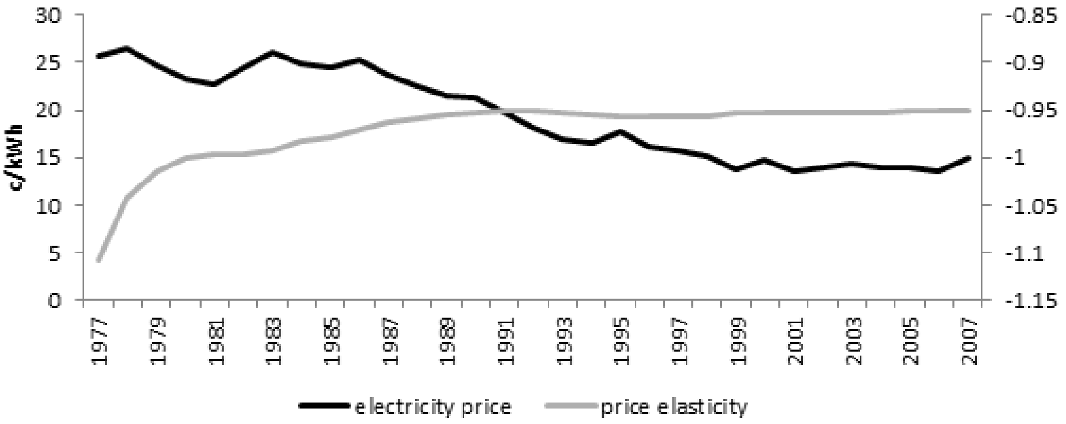


Figure 3: Electricity prices and estimated price elasticity for the industrial sector 1977–2007

ing the behaviour of this sector regarding electricity consumption will assist policy-makers in implementing appropriate policies. The sector's electricity performance has recently attracted attention. Ziramba (2009) studied the energy consumption of the industrial sector in South Africa and its interaction with other variables such as industrial output and employment (but not electricity prices). Later, Inglesi-Lotz and Blignaut (2011a) using panel data techniques, found that the industrial sector's electricity consumption was sensitive to price and output fluctuations on average during the period 1993 to 2006.

Most studies assume that the price elasticity of electricity demand remains constant through the years, that is industrial consumers behave the same way to price fluctuations regardless the economy's conditions or the actual level of prices. In South Africa, electricity prices have been low for a long period of time, which means that the economy as a whole did not react to price changes (Inglesi-Lotz, 2011). This paper follows Inglesi-Lotz (2011), who did an analysis for economy-wide electricity consumption, and uses the Kalman filter methodology to allow the price elasticity of industrial electricity demand to be time-varying. To capture other factors affecting electricity consumption, real output and employment are also included in the specification.

The findings show that price sensitivity has indeed changed since the 1970s: it has decreased in absolute values from -1 in 1980 to -0.953 in 1990. The elasticity stabilised at approximately -0.95 showing that the industrial sector has experienced an inelastic demand. In other words, the behaviour of industrial consumers did not vary significantly during the 2000s. This also confirms the main conclusion of Inglesi-Lotz (2011) that sensitivity of consumers to price fluctuations becomes smaller in absolute terms, while the real prices of electricity declined over the last half of the sample period. In addition, both papers show that the price elasticity of the electricity demand in the industrial sector or the economy as a whole has remained relatively constant, while prices were not fluctuating significantly. In other words, the sensitivity and behaviour of the consumers had remained unchanged; however, as soon as prices start varying it should be expected that the consumer's reaction to these changes will also alter.

These results also enable policy-makers to speculate about the effect of further electricity price increases planned by Eskom and NERSA for the next couple of years. An immediate change in the industrial sector's behaviour with the increase of prices should not be expected. However, in the long run and as the prices increase, probably reaching the levels of the 1970s or even before, the industrial sector's behaviour might change and the elasticity might end up at levels higher than one (elastic).

Note

1. The detailed discussion on the Kalman filter methodology is adopted directly from Inglesi-Lotz (2011).

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Appendix on following page

Appendix: Data

Source	NEC (1990) and DoE (various issues)	DoE (2009)	Quantec (n.d)	Quantec (n.d)
Variable	Electricity consumption of the industrial sector	Average electricity price of industrial sector (2005=100)	Real economic output of industrial sector	Employment
Unit of measurement	kWh	ZAR cents per kWh	ZAR	Number
1970	11,437,198,074.4	17.5	407,579,700,000.0	1,490,016.0
1971	12,351,060,507.8	17.0	409,910,300,000.0	1,569,278.7
1972	14,076,379,729.7	16.8	430,142,100,000.0	1,654,393.4
1973	15,928,682,563.9	16.4	469,797,200,000.0	1,799,111.2
1974	17,385,874,576.1	16.3	487,468,600,000.0	1,953,699.5
1975	19,396,045,044.7	16.6	538,344,400,000.0	2,047,988.8
1976	21,180,655,751.3	19.3	537,548,800,000.0	2,062,257.5
1977	21,735,630,111.7	25.6	508,994,900,000.0	1,955,811.7
1978	22,948,799,150.3	26.5	522,236,600,000.0	1,912,488.0
1979	25,846,573,660.7	24.6	537,636,500,000.0	1,969,115.9
1980	28,240,586,781.3	23.2	597,951,700,000.0	2,132,894.4
1981	30,618,678,400.9	22.6	683,286,300,000.0	2,321,714.9
1982	30,827,067,618.8	24.5	656,502,300,000.0	2,415,166.6
1983	32,709,323,916.2	26.1	661,211,800,000.0	2,380,162.2
1984	34,338,415,810.2	24.9	691,218,700,000.0	2,396,527.3
1985	36,290,778,094.6	24.5	654,709,600,000.0	2,382,966.0
1986	38,207,712,371.6	25.2	629,326,800,000.0	2,411,862.4
1987	37,406,124,690.1	23.6	649,062,900,000.0	2,489,743.5
1988	40,851,349,812.2	22.5	686,182,900,000.0	2,568,084.0
1989	43,070,289,785.9	21.6	707,251,100,000.0	2,622,583.1
1990	43,222,941,451.0	21.4	725,978,600,000.0	2,644,664.0
1991	43,375,593,116.0	19.7	711,345,700,000.0	2,616,287.3
1992	43,528,244,781.0	18.2	702,482,500,000.0	2,587,787.4
1993	43,680,896,446.0	16.9	709,118,900,000.0	2,596,795.6
1994	43,013,872,000.0	16.6	728,422,800,000.0	2,630,996.0
1995	47,481,281,000.0	17.8	775,522,300,000.0	2,681,508.1
1996	55,072,548,370.0	16.1	788,989,500,000.0	2,705,824.5
1997	61,069,678,450.0	15.8	810,489,000,000.0	2,644,922.1
1998	72,663,627,000.0	15.1	851,319,600,000.0	2,516,819.6
1999	70,796,010,000.0	13.8	892,966,300,000.0	2,388,759.2
2000	70,664,869,000.0	14.8	1,007,855,400,000.0	2,326,731.6
2001	74,778,010,000.0	13.5	1,060,504,200,000.0	2,371,413.0
2002	83,581,150,000.0	13.9	1,116,408,000,000.0	2,467,226.9
2003	78,795,790,000.0	14.4	1,140,144,000,000.0	2,174,423.9
2004	101,557,231,000.0	14.0	1,190,726,000,000.0	2,231,433.1
2005	81,521,448,000.0	14.0	1,242,088,500,000.0	2,316,355.4
2006	85,127,404,000.0	13.6	1,309,430,400,000.0	2,500,722.6
2007	83,457,753,781.3	14.9	1,378,976,000,000.0	2,584,890.4

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