

**The Political Economy of Institutions, Stability and Investment: a simultaneous equation approach in an emerging economy – the case of South Africa**

J.W.Fedderke<sup>1</sup>

Professor of Economics  
School of Economics  
University of Cape Town

J.M.Luiz<sup>2</sup>

Professor of Economics  
Graduate School of Business Administration  
University of the Witwatersrand

---

<sup>1</sup> email: [jfedderk@commerce.uct.ac.za](mailto:jfedderk@commerce.uct.ac.za), tel: 27-21-650-5238.

<sup>2</sup> email: [luiz.j@wbs.ac.za](mailto:luiz.j@wbs.ac.za), tel: 27-11-717-3578.

## **The Political Economy of Institutions, Stability and Investment: a simultaneous equation approach in an emerging economy – the case of South Africa**

### *Abstract*

The modern theory of investment identifies the importance of uncertainty to investment. A number of empirical studies have tested the theory on South African time series, employing political instability measures as proxies for uncertainty. This paper verifies that political instability measures are required in the formulation of the investment function for South Africa. It also establishes that there are distinct institutional factors that influence the uncertainty variable such as property rights and crime levels. We find that rising income and property rights lower political instability, and that rising crime levels are positively related to political instability. The inference is that political instability in South Africa may not represent uncertainty directly, since it is systematically related to a set of determinants. Instead, uncertainty would have to be understood as being related to a broader institutional nexus that in concert may generate uncertainty for investors.

**JEL:** P14, P16, E22, C22, O55

**Keywords:** Investment, uncertainty, political instability, property rights, political rights, crime, South Africa.

## 1.0 Introduction

The modern theory of investment accepts that the investment decision is affected a future that is unknown and therefore uncertain. Dixit and Pindyck's (1994) treatment of the irreversibility of investment, systematically introduces the importance of uncertainty to the investment decision.

A number of papers have tested the Dixit-Pindyck framework using South African longitudinal data as basis. Fielding (1997), using an aggregate investment analysis, emphasises that investment has irreversibility and asymmetrical adjustment costs associated with it. Fedderke (2001, 2004) using panel analysis of manufacturing sectors finds that uncertainty is a significant determinant in the investment function. Mariotti (2002) and Kularatne (2002) also find direct support that uncertainty is a factor in investment using aggregate data in multiple equation growth models for South Africa.

All of these studies have in common the feature that uncertainty is measured by reference to political instability, though the measures employed are not identical across all the cited studies.

This paper examines the possibility that political instability may not be as unsystematic as the interpretation of its impact as uncertainty would imply. While political instability may render future investment returns uncertain, the intensity of political instability may potentially be systematically related to underlying institutional, social and political determinants.

Three core theoretical propositions are considered in developing an understanding of political instability in South Africa. Modernization theory attributes political instability to the disruption of traditional institutional structures due to economic development. An alternative attributes the primary driver of political instability to political aspirations that arise from opposition to what is perceived to be an "unjust" political dispensation. The final explanatory framework attributes primacy to the evolution of property rights and the broader institutional framework associated with the property rights. Political instability arises under conditions where poorly defined property rights provide perverse incentives to economic agents.

The core finding of the paper is that political instability may indeed be said to be systematically related to the development of property rights, to crime, as well as to an indicator of real economic development. The only framework that does not receive support as a determinant of political instability on this evidence is that which attributes primacy to political rights and aspirations.

On this understanding the understanding of uncertainty and its relevance to investment has been modified. Political instability is no longer exogenous, but subject to endogenous structural determination. Uncertainty does not dissipate – but attaches to a constellation of institutions.

Section 2 of the paper briefly outlines the theory of irreversible investment. The empirical model examined in the paper is developed in section 3. The characteristics of the data are explored in section 4. Estimation results are presented in section 5, and section 6 concludes.

## 2.0 Theoretical background

Economic theory grounds the analysis of investment in the optimizing behaviour of firms. In early theoretical work<sup>3</sup> the assumption was that firms instantaneously and costlessly adjust capital stock, with the consequence that the optimization problem of the firm becomes essentially static rather than dynamic. In particular, optimization requires that the marginal product of capital be equated to its user cost at all time points. The consequence was that the dynamic adjustment path which provides the investment flow could only be realized as an ad hoc extension not behaviourally grounded.<sup>4</sup>

The reason for this limitation attaches to the assumption of an absence of adjustment costs in capital stock. Two resolutions to these limitations have emerged in the literature. Both introduce friction into the investment relationship, though they differ as to the source of such friction. In the first extension, the assumption of zero adjustment costs in capital stock is abandoned. The second extension attributes friction in investment to the irreversibility of the investment decision.<sup>5</sup>

In the classic contribution of Eisner and Strotz (1963) the optimization problem of the firm focuses directly on the alteration of the firm's plant size, and is concerned to maximize net profit subject to adjustment costs associated with changing the fixed capital stock. The key lies in the convexity of adjustment costs. An adjustment path of capital stock from existing to intertemporal equilibrium that is explicitly grounded in optimizing firm behaviour is now derivable. Tobin's q-theory of investment<sup>6</sup> represents one possible operationalization of these principles.

However, what is absent from the investment model incorporating adjustment costs in capital stock is any indication that optimization over an infinite time horizon introduces uncertainty. It is this possibility that is identified by introducing the irreversibility of investment - and it is on this approach that the present paper will focus.

The possibility that investment is irreversible in the sense that resale of capital goods is not possible except at some discount relative to their purchase price less depreciation, introduces a second friction into the investment relation.<sup>7</sup>

---

<sup>3</sup> Perhaps most closely associated with the work of Jorgenson - see for instance Jorgenson (1963). The discussion in Bertola and Caballero (1994) and Ferderer (1993) is also instructive.

<sup>4</sup> See the discussion in Abel and Blanchard (1988:249), and Sensenbrenner (1991:819).

<sup>5</sup> Note that in Abel and Eberly (1994) both of these alternatives are combined in a general model.

<sup>6</sup> See Tobin (1969), Tobin and Brainard (1968) and (1977) - and see also the discussion in Abel (1983), Hayashi (1982), Mussa (1977), and Sensenbrenner (1991).

<sup>7</sup> Irreversibility of investment is really just another form of (infinite) adjustment cost. Treatment of investment under irreversibility also has a long history in the literature - see for instance Aiginger (1987),

Since the irreversibility friction prevents the firm from divesting itself of capital stock in the face of a negative demand shock, uncertainty over future demand assumes greater significance under this class of model than in alternative approaches to optimal investment expenditure.<sup>8</sup> In particular, it means that it may pay to wait before investing, since irreversibility attaches an opportunity cost to undertaking the investment expenditure now rather than in the future.

Let the firm's production function be  $f(K)$  and let the firm's uncertain demand be given by  $P = C D(f(K))$ , where  $P$  is price,  $C$  is a shift parameter subject to Brownian motion.<sup>9</sup> The profit flow of the firm is given by  $\pi$ . Let:

$$dC = \alpha C dt + \sigma C dz \quad (2.1)$$

$$\text{then } \pi = C \cdot D(f(K)) f'(K) = C \cdot R(K) \quad (2.2)$$

where  $R(K)$  is the revenue function in capital.<sup>10</sup> The firm must now decide to invest or not to invest, in order to maximise the present value of the expected profit.

Solution of the dynamic programming problem provides the investment frontier  $C(K)$ :

$$C(K) = \frac{\beta}{\beta - 1} \frac{\delta_k}{R'(K)} \quad (2.3)$$

where  $\beta$  is the positive root of:

$$\varphi = \frac{1}{2} \sigma^2 \beta(\beta - 1) + (\rho - \delta)\beta - \rho \quad (2.4)$$

which is:

$$\beta = \frac{1}{2} - \frac{\alpha}{\sigma^2} + \sqrt{\left(\frac{\alpha}{\sigma^2}\right)^2 + \frac{2\rho}{\sigma^2}} > 1 \quad (2.5)$$

Investment will occur only if the expected marginal profit from capital,  $C(k) \cdot R'(K) / \delta_k$ , is greater than the cost of installation of the additional unit of capital by  $\beta / (\beta - 1) > 1$ . This investment boundary is dependent on the discount rate ( $\rho$ ), the trend parameter ( $\alpha$ ) and its associated volatility ( $\sigma$ ). An increase in any of these variables will lead to a decrease in  $\beta$ ,<sup>11</sup> which leads to an increase in the option value through  $\beta / (\beta - 1)$ , raising the investment

Arrow (1968), Bernanke (1983), Dixit and Pindyck (1994), McDonald and Siegel (1986), Nickell (1978), and Pindyck (1988) and (1991).

<sup>8</sup> In the absence of the irreversibility friction, negative demand shocks in the firm's industry, can be countered by divesting the capital stock at fair market prices to firms in sectors not subject to the shock.

<sup>9</sup> Brownian motion here introduces uncertainty, such that

$$BM = dx = \alpha x dt + \sigma x dz$$

$dz = \varepsilon \sqrt{dt}$  for  $\varepsilon_i \sim N(0,1)$  such that  $E(\Delta z) = \alpha \Delta t$  and  $Var(\Delta z) = \sigma^2 dt$ . Both terms capture uncertainty, with  $\alpha x dt$  a trend term and  $\sigma x dz$  volatility surrounding the trend.

<sup>10</sup> Where  $R'(K) > 0$  is the marginal revenue product and  $R''(K) < 0$ , concave in  $K$ .

<sup>11</sup> Because  $\frac{\partial \beta}{\partial \alpha} < 0$ ,  $\frac{\partial \beta}{\partial \sigma} < 0$ ,  $\frac{\partial \beta}{\partial \rho} < 0$ .

boundary. Note that even though  $\sigma$  is increasing the boundary, increased volatility may allow the boundary to be hit more often than in a situation with lower volatility, leaving the sign of the impact of uncertainty ambiguous a priori.

It is therefore unclear if there will be increased or decreased investment in the presence of increasing uncertainty.

### 3.0 An extended investment model for South Africa

The crucial question that arises from the theoretical framework presented in section 2 concerns how uncertainty is to be operationalized in any empirical application.

Recently a number of papers have examined investment models for South Africa. Table 1 reports the signs found for variables included in these studies. All the studies reported here have incorporated variables interpreted within the studies as measures of uncertainty.

**Table 1 – Prior findings of relationships with investment for South Africa**

Policy variables	Fielding (1999)	Fielding (1997)	Fedderke (2004)	Mariotti (2002)	Kularatne (2002)
Cost of capital	-		-	-	-
Real interest rate		-			
Price non traded capital		-			
Wage elasticity	-				
Output (expected future demand)	+		+	+	+
Index of opportunity	+				
Rate of return on capital			+		
Macroeconomic instability	-				
Political and economic uncertainty		-	-	-	-
Demand uncertainty			-		
Real cost of labour		+	+		
Enrolment rate (human capital)				+	
Government consumption				-	
Private credit extension					+
Equity market liquidity (Value added ratio)					+

Source: adapted from Henderson (2004).

The first point to note concerning the reported findings is that despite the variety of estimation approaches adopted by the studies, and the variety of specifications employed, the finding of a negative impact on the variables interpreted as uncertainty measures is pervasive. The second point to note is that many of the studies under consideration have employed political uncertainty as one, in many instances even as the primary, measure of uncertainty. The primary contender as an alternative uncertainty measure is demand volatility.

The use of political instability as a measure of *uncertainty* raises an important conceptual question.

If political instability is indeed to be understood as *uncertainty* in a proximate sense, the presumption must be that it is in some fundamental sense unsusceptible to systematic explanation. Yet such a presumption would seem to stretch credibility – especially in the South African context which has seen considerable energy devoted not only to the analysis of social and political transitions, but also to the relation between political change and economic growth.

At least three distinct positions are identifiable in the literature, which either explicitly or implicitly link political instability to underlying structural factors that come to determine it. We note immediately that these are idealizations of the approaches that have been adopted by various authors – many of whom show elements of all three of the identified mechanisms leading to political instability.<sup>12</sup>

The modernization hypothesis of Lipset (1959) posits the evolution of political institutions, and democracy in particular, as a consequence of economic development.<sup>13</sup> The implication is that economic growth, and the evolution of per capita GDP is not only the source of political development, but as a necessary corollary it will entail significant disruption of established political order in the process of realising the change. One author states the link as follows:

Social and economic change ... extend political consciousness, multiply political demands, broaden political participation. These changes undermine traditional sources of political authority and traditional political institutions ... The result is political instability and disorder. The primary problem of politics is a lag in the development of political institutions behind social and economic change (Huntington, 1968:5).

On this view therefore, economic development can be identified as a (if not the) source of political instability.<sup>14</sup>

An alternative view attributes primacy to the political. Political instability on this view is attributable to frustrated political aspiration. The core mechanism underlying political instability on this view is a failure of a political order to gain acceptance due to a rupture in the consistency and coherence of the principles on which it is based. This results in an inability of the political system to represent adequately the values and identity of those whom it serves, finally leading to change in more or less violent form.<sup>15</sup> This has been formulated as:

---

<sup>12</sup> In the South African instance, see for instance Wood (2000).

<sup>13</sup> For a fuller exploration of the theoretical underpinnings of this view and related empirical evidence, see Diamond (1992), and the wider comparative discussion in Fedderke (1997).

<sup>14</sup> In traditional South African growth debates, this view underpins the interpretation of the South African growth path that is present in the contributions of O'Dowd (1974, 1978), and Bromberger (1974, 1978), for instance. Presentation of international evidence is myriad with both affirmative (see for instance Muller (1997)) and more sceptical views present in the literature (see for instance Huntington (1984), though the scepticism is revised somewhat in (1991)).

<sup>15</sup> The quintessential example of such change is perhaps the American war of independence. Economic interests were if anything harmed by severing colonial ties, yet the principle of “no taxation without representation” identified a conflict of principles deemed (on this interpretation) sufficiently fundamental

the realization of freedom presupposes a history, and one full of struggle and conflict. And we can consider it providential that men are not inclined by nature to harmony, but are marked by antagonism, by ‘unsocial sociability.’ For this is what goads them ever onward towards the only stable solution possible for human society, a law-governed social order. Meanwhile, as we look over the span of centuries, we can see men driven ever by their own conflicts and tensions towards their own destinies. (Taylor, 1985:336)

The fundamental point for our purposes here is that the impetus to political change and instability is political – not economic. Such a conception is consistent with the imperatives that underlie debates around justice and its consequences for the shape of human society,<sup>16</sup> as well as recent conceptions of what it means to undergo economic development in a fuller sense.<sup>17</sup>

A third influential contribution has identified a more concrete set of mechanisms that underlie instability. In the understanding of institutions pioneered by North (1990), they are viewed as rules of the game governing societal interactions. It follows that institutions can explain not only a significant component of economic activity, but that since they constitute the rules of interaction between agents, they may themselves come to explain either well-functioning or dysfunctional social systems and their evolution over time.<sup>18</sup> The presence of a set of rules of the game provided by institutions, still leaves considerable scope for strategic interaction between agents, and leaves considerable scope for change over time through unintended consequences of strategic interaction. North himself observes:

Long-run economic change is the cumulative consequence of innumerable short-run decisions by political and economic entrepreneurs that both directly and indirectly (via external effects) shape performance. The choices made reflect the entrepreneurs’ subjective modeling of the environment.... Because the models reflect ideas, ideologies, and beliefs ... *the consequences of specific policies are not only uncertain but to a substantial degree unpredictable*.... However, the increasing-returns characteristics of the institutional matrix and the complementary subjective models of the players suggest that although the specific short-run paths are unforeseeable, the overall direction in the long run is both more predictable and more difficult to reverse (North, 1990: 104 - *emphasis added*).

Good institutions are those that provide predictability and incentives for growth-enhancing activities by inducing productive behaviour from economic players. In economic terms good institutions are characterised by the enforcement of property rights so that individuals have incentives to invest and partake in economic activities; constrains on the actions of elites, politicians, and other powerful groups, in order to prevent expropriation; and some degree of equal opportunity which enables agents to participate

---

by American citizens to merit war. In the South African debate this position has been consistently argued as a (perhaps the) fundamental force for political change by De Kadt (2001).

<sup>16</sup> The contributions here are too numerous to mention, and the present discussion is not aimed at an exploration of alternative conceptions of justice and their welfare implications. But certainly the work of Rawls (1971) and his respondents has had a substantial impact on conceptions of welfare in economics.

<sup>17</sup> See for example the discussion of development as freedom, in Sen (1999).

<sup>18</sup> See Luiz (2005), Engerman and Sokoloff (2003), Fedderke (2004) and the seminal work by North (1990).

in economic activity.<sup>19</sup> By inference, poor institutions, rather than generating a stable predictable environment, may be the source of conflict and unpredictability of the economic environment.

The nature of the property rights in a country is likely to affect political instability through various channels. Insecure property rights result in challenges to property 'ownership' with no legitimate mechanisms to resolve these which make violence a viable, and often successful, option. In theory, secure property rights should lower instability because it is up to the legal framework to resolve disputes and the incentive to engage in acts of violence are thereby rendered redundant. However, where the property rights regime is such that it entrenches old orders and high levels of inequality then in fact there are perversely high incentives for agents to undermine the status quo through any means. Property rights are therefore most effective in lowering instability when they are not only well defined but also widely dispersed so that most have an interest in supporting them and have something to lose through an unstable environment.

In the South African context the hypothesis would be that the apartheid dispensation in South Africa was an example of a dysfunctional institution system that triggered distributional conflict. The inequitable distribution of property rights led to a situation where different racial and ethnic groups were pitted against each other in conflict. Marginalised groups (blacks under apartheid), who were prevented from participating fully in economic activity and were prohibited from property ownership in large areas of the country, had little incentive to engage in productive activities and had high incentives to undermine the racist institutional framework. The consequence was increased instability and hence rising uncertainty in the institutional structure itself.

Whilst we know that enforceable property rights are a necessary but insufficient condition for economic growth,<sup>20</sup> the nature of the property rights in South Africa were such that there was a likely impact on the levels of crime in the economy.<sup>21</sup> In the context of this paper, crime in South Africa was associated with both 'normal' criminal activities as well as those induced by the institutional framework of racial estates. The exclusionary nature of property rights meant that there was no incentive to respect the institutions which govern property and indeed there were real incentives to undermine them with the resulting rises in criminal activity. There may also be an indirect impact of crime. If agents had become accustomed to violating apartheid laws, this may have had spill over effects into other forms of crime which further raises instability and uncertainty.

The model which follows controls both for the framework of rules in the economy (political and property rights) as well as the level of enforcement of the rules (a crime variable).

---

<sup>19</sup> See for instance the discussion in Acemoglu (2003:27).

<sup>20</sup> See Acemoglu (2003), Luiz (2005), North (1990), and Fedderke (2004).

<sup>21</sup> See for example, Luiz (2001) who explores the dynamics of crime in South Africa and its relationship with economic variables.

Investment theory now leaves us with mapping from expected future returns to investment, the user cost of capital, uncertainty and potentially property rights into investment rates. In South African investment functions political instability has become the standard measure of uncertainty. The preceding discussion now suggests the endogenization of political instability. The three alternative views on the source of political instability suggest a mapping from either output (GDP), political rights, or property rights into political instability respectively.

A strong test of the three accounts of institutional instability might test the two equation system given by rows (1) and (2) of Table 2, as appropriate.

We have already noted that the three conceptions advanced as sources of political instability need not be mutually exclusive. It is conceivable that economic development, political aspirations, as well as strategic interaction within the rules of the game provided by property rights all play a role in stimulating political instability. Indeed, as we have noted in the work of most authors (including those cited in support of the various ideal cases above) this is generally the case. A more sophisticated understanding of the three mechanisms might therefore insist on a weak test, based on the estimation of the two equation system given by rows (1) and (3) of Table 2. The weak version of the three theories would in each instance accord weak exogeneity status to the primary driver identified. Thus the weak modernization view might allow an impact of political and property rights, but accord temporal primacy to GDP in setting it weakly exogenous in estimation. Symmetrically, primacy of political aspirations would set political rights weakly exogenous, while primacy of property rights would accord weak exogeneity to the property rights measure.

**Table 2: The Three Conceptions of Political Instability in the Context of an Investment Model**

Row:	Modernization Theory	Primacy of the Political	Primacy of Institutions: property rights
1. Investment:	$I = f(Y, uc, INST, PROP)$	$I = f(Y, uc, INST, PROP)$	$I = f(Y, uc, INST, PROP)$
2. Strong Test	$INST = g(Y)$	$INST = h(POL)$	$INST = m(PROP)$
3. Weak Test	$INST = n(Y, POL, PROP, CR)$ <i>Y weakly exogenous</i>	$INST = n(Y, POL, PROP, CR)$ <i>POL weakly exogenous</i>	$INST = n(Y, POL, PROP, CR)$ <i>PROP weakly exogenous</i>
I=investment rate; Y=output; uc=user cost; INST=political instability; PROP=property rights; POL=political rights; CR=crime rate.			

What is clear is that on any of these alternative conceptions of the source of political instability, the understanding of uncertainty and its relevance to investment has been transformed. Political instability on all three conceptions is no longer exogenous, but subject to endogenous structural determination.

It does not follow that uncertainty has been dissipated. Instead, uncertainty can be viewed as attaching to the constellation of institutions that together come to generate political

instability<sup>22</sup> – as well as the consequences of such instability when it emerges, since the consequences of a predictable event need not themselves be predictable in their own right.

#### 4.0 The Data

The South African case affords a unique opportunity to investigate the system of equations given in Table 2. Measures of the institutional dimensions required for the system of equations have been reported in a prior study<sup>23</sup> – and to the best of our knowledge are not available for other economies. This provides us with a data sample covering the period from 1954 to 1992. Sample size is restricted by data availability. For estimation purposes sample size is restrictive, affecting the power of the statistical tests reported. Details of the variables employed in the study and their sources are reported in Appendix A.

Table 3 reports Augmented Dickey-Fuller tests for stationarity. For all variables of the study the finding is of first difference stationarity.

**Table 3 - Reported Augmented Dickey-Fuller test results**

Variable	$\sim I(0)$	$\sim I(1)$	Critical Value
<i>INVRAT</i>	-1.38	-5.59*	-2.92
<i>LNRGDP</i>	-2.92	-3.86*	-2.92
<i>USER</i>	-1.93	-5.59*	-3.52
<i>LNINSTAB</i>	-3.34	-7.68*	-3.51
<i>CRIMPOP</i>	-2.65	-6.40*	-3.52
<i>LNPROP</i>	1.64	-6.65*	-2.94
<i>LNPOL</i>	-0.68	-3.98*	-2.94

\* Represents the rejection of the unit root null hypothesis at the 5% significance level.

#### 5.0 Empirical Methodology and Estimation Results

In estimation we employ the VECM methodology. The methodology is now standard, so that exposition can be brief.<sup>24</sup>

Consider the general VAR (Vector Autoregressive Estimation) specification given by:

$$z_t = A_m z_{t-1} + \dots + A_m z_{t-m} + \delta + v_t \quad (5.1)$$

where  $z_t$  is a  $n \times 1$  matrix,  $m$  is the lag length,  $\delta$  deterministic terms and  $v_t$  a Gaussian error term. Reparametrization provides the VECM specification:

<sup>22</sup> Note that this accords well with the finding in Fedderke and Klitgaard (1998) that social, institutional and political variables hang together by means of “webs of association.”

<sup>23</sup> See Fedderke, De Kadt and Luiz (2001a).

<sup>24</sup> See the more detailed discussion in Johansen (1988), Johansen and Juselius (1990, 1991, 1992).

$$\Delta z_t = \sum_{i=1}^{k-1} \Gamma_i \Delta z_{t-i} + \Pi z_{t-k+1} + \delta + v_t \quad (5.2)$$

where  $\Pi = \alpha\beta'$ . We refer to  $\alpha$  as the loading matrix, containing the short-run dynamics, while  $\beta$  is the matrix containing the long run equilibrium (cointegrating) relationships. The rank,  $r$ , of the matrix represents the number of cointegrating vectors and is tested for using the standard Trace and Maximal Eigenvalue test statistics. Where  $r > 1$  issues of identification arise.<sup>25</sup> Just identification can proceed by means of restrictions on  $\Gamma$ ,  $\alpha$ , or  $\beta$  space.<sup>26</sup>

### 5.1 Parameterisation

A number of variables are standard to investment functions. The core of all investment functions is an attempt to identify net rates of return to investment – with output frequently serving as an indicator of expected future returns to investment, while the user cost of capital serves as a measure of the marginal cost of investment. Finally, both a proxy for uncertainty and potentially property rights are identified as relevant to investment decisions. These considerations suggest the empirical investment model represented as:

$$I_t = b_0 + b_1 \ln Y_t^e - b_2 uc_t + b_3 INST_t + b_4 PROP_t \quad (5.3)$$

where  $I_t$  denotes the investment rate as measured by INVRAT,  $Y_t^e$  is expected output,  $uc_t$  is the user cost of capital,<sup>27</sup> political instability is denoted  $INST_t$ ,  $PROP_t$  denotes property rights and  $CR_t$  a measure of crime. Theoretical priors suggest  $b_1, b_2, b_4 > 0$ , while previous empirical work on South Africa predicts  $b_3 < 0$ .

The preceding discussion also suggests the endogenization of political instability. The three alternative conceptions of the source of instability might suggest straightforwardly:

$$INST_t = d_0 + d_1 X_t \quad (5.4)$$

where  $X_t$  denotes either  $Y_t$  (modernization),  $POL_t$  as a measure of political rights (political aspiration), or  $PROP_t$  (North's property rights), in three alternative formulations of the core propositions advanced in explanation of political instability. A strong test of the three accounts of institutional instability might test the two equation system given by (5.3) and (5.4), in which the favoured regressor has been loaded.

We have already noted that the three conceptions advanced as sources of political instability need not be mutually exclusive. It is conceivable that economic development, political aspirations, as well as strategic interaction within the rules of the game provided

<sup>25</sup> See Wickens (1996), Johansen and Juselius (1990, 1992), Pesaran and Shin (1995a, 1995b), Pesaran, Shin and Smith (1996).

<sup>26</sup> See Greenslade et al, 1999:3ff.

<sup>27</sup> The user cost of capital is introduced into the model in order to assess the marginal cost of capital.

by property rights all play a role in stimulating political instability. Indeed, as we have noted in the work of most authors (including those cited in support of the various ideal cases above) this is generally the case. A more sophisticated understanding of the three mechanisms might therefore insist on a weak test. Here estimation of:

$$INST_t = h_0 + h_1 \ln Y_t^e + h_2 POL_t + h_3 PROP_t + h_4 CR_t \quad (5.5)$$

would allow for a test of weak exogeneity of the mechanism which is accorded primacy in the three alternative views.  $CR_t$  denotes the crime rate variable measured by CRIMPOP. Thus the weak modernization view might allow an impact of political and property rights, but accord temporal primacy to GDP in setting it weakly exogenous to the VECM in estimation. Symmetrically, primacy of political aspirations would set political rights weakly exogenous, while primacy of property rights would accord weak exogeneity to the property rights measure. Inclusion of the crime rate is on the basis of the discussion of section 2 above.

We begin estimation with a simple the formulation given by:

$$\Pi z_{t-k+1} = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \\ \alpha_{31} & \alpha_{32} \\ \alpha_{41} & \alpha_{42} \\ \alpha_{51} & \alpha_{52} \\ \alpha_{61} & \alpha_{62} \\ \alpha_{71} & \alpha_{72} \end{bmatrix} \begin{bmatrix} 1 & -\beta_{12} & \beta_{13} & -\beta_{14} & -\beta_{15} & \beta_{16} & 0 \\ 0 & \beta_{22} & 1 & -\beta_{24} & \beta_{25} & \beta_{26} & \beta_{27} \end{bmatrix} \begin{bmatrix} I_t \\ Y_t \\ INST_t \\ CR_t \\ UC_t \\ PROP_t \\ POL_t \end{bmatrix} \quad (5.4)$$

where  $I_t$  represents the investment rate given by INVRAT;  $Y_t$  represents real GDP measured by LNRGDP;  $UC_t$  represents the user cost of capital as measured by USER;  $P_t$  represents political instability as measured by INSTAB;  $CR_t$  represents the crime rate as measured by CRIMPOP;  $PR_t$  represents property rights as measured by PROPRIGHT; and  $POL_t$  represents political rights as measured by POLRIGHT.

The strong tests of the three conceptions of the source of political instability captured by equation (5.4) are given by the three sets of over-identifying restrictions given by  $\beta_{24}=\beta_{25}=\beta_{26}=\beta_{27}=0$  (modernization);  $\beta_{22}=\beta_{24}=\beta_{25}=\beta_{26}=0$  (political primacy);  $\beta_{22}=\beta_{24}=\beta_{25}=\beta_{27}=0$  (institutions; property rights).

The weak tests of the three conceptions of the source of political instability captured by equation (5.5) are given by the three sets of over-identifying restrictions given by  $\beta_{25}=\alpha_{21}=\alpha_{22}=0$  (modernization);  $\beta_{25}=\alpha_{71}=\alpha_{72}=0$  (political primacy);  $\beta_{25}=\alpha_{61}=\alpha_{62}=0$  (institutions; property rights).

## 5.2 Estimation Results

We estimate by the Johansen VECM technique. Associated maximal eigenvalue and trace statistics are reported in Table 4.

**Table 4 - Maximal eigenvalue and trace statistics; VAR=3**

Null	Alternative	Eigenvalue Statistic	95% Critical Value	Trace Statistic	95% Critical Value
r=0	r=1	75.68 *	49.320	237.06*	147.270
r≤1	r=2	63.16*	43.610	161.37*	115.850
r≤2	r=3	28.70	37.860	98.21*	87.170
r≤3	r=4	23.31	31.790	69.51*	63.000
r≤4	r=5	21.52	25.420	46.20*	42.340
r≤5	r=6	16.76	19.220	24.68	25.770
r≤6	r=7	7.92	12.390	7.92	12.390

\* denotes rejection of the null at the 5% level.

Both tests reveal the presence of at least two cointegrating vectors – and in the case of the trace statistic of up to five CV's. While generally the trace statistic might be given preference on the grounds of its better power characteristics in small samples, we proceed on the assumption of two CV's, for three reasons. First, the eigenvalue statistic gives unambiguous support to the presence of twin vectors. Second, given that a number of variables included in the study are likely partially integrated (particularly CRIMPOP), the test statistics may well overstate the number of cointegrating linear combinations of variables. Given the absence of prior theoretical guidance on a just identifying structure to be imposed on the cointegrating space, we therefore proceed on the assumption of two vectors.

Estimation proceeds under (5.4), with associated over-identifying restrictions given by the strong and weak test versions of the hypothesized mechanisms governing political instability.

Results from estimation under the strong test are reported in Table 5. Columns (1) through (3) report VECM estimation results for the modernization, political primacy, and institutions/property rights formulations respectively. Columns (1a) through (3a) reported the associated elasticities computed at mean values of relevant variables.

All variables in the estimated investment relationships report coefficients that accord with prior sign expectations; output and property rights are positive, and report economically strong impacts on investment rates; political instability and the use cost of capital have negative coefficients and have a somewhat more muted economic impact. For the investment relation, all three models confirm error correction at least in the cointegrating vector associated with investment expenditure.

A disconcerting feature of the results is the very strong output elasticities reported for the investment relation. Even granting the estimation in stock-flow format, in all three

estimated models the output elasticity is strong – but this proves particularly marked for the specification testing for political primacy of political instability. Indeed, the political primacy formulation generally reports considerably stronger elasticities than the alternative models.

Additional difficulties emerge from a consideration of the second cointegrating vector in all three models estimated. Both the political and the property rights variables report the anticipated sign – with rising rights associated with decreasing levels of political instability. However, while the implied mean elasticity associated with political rights is perhaps plausible (0.4), that associated with property rights is too dramatic (66.58) to be credible. The modernization process receives support provided one provides a “pressure cooker” interpretation – with rising output generating increased instability under a repressive system (political rights are of course not controlled for in this long run formulation). Finally, for all three models, but particularly for the political primacy specification, the error correction process is weak at best, and potentially absent.

While there is thus some evidence consistent with each of the hypothesized structural determinations of political instability, the evidence for all in the strong sense of providing an exclusive explanation of instability, is weak at best. Parameter instability, implausibly large elasticities, and poor error correction behaviour is suggestive of an underspecified set of estimations.

The logical extension in estimation is the formulation of the weak tests discussed in the preceding sub-section. Here all three determinants are allowed to drive political instability – but primacy is accorded to one explanation by assigning weak exogeneity status to the relevant explanatory variable, output, political rights, or property rights.

Estimation results are presented in columns (0) through (3) of Table 6, with the associated implied elasticities at mean values of relevant variables in columns (0a) through (3a).

Results here are disappointing. The signs of all variables but property rights accord with priors: negative impact of political instability and user cost on investment, a positive impact of output and property rights; for political instability, a dampening effect emerging from output, and political rights, but rising instability from rising crime, and improving property rights. However, the finding is of improving property rights raising political instability. More importantly, the elasticities particularly on output in both the investment and the instability vectors are implausibly large (approximately 20 and 15 respectively), as are the elasticities that attach to property rights in the instability vector particularly, but also the investment relation. Finally, all evidence of any error correction for the political instability relation dissipates. Findings are invariant to the specification, or the weak exogeneity assumption being made.

Evidence from neither the strong nor the weak tests of the potential determinants of instability is thus compelling. In the weak test, evidence in favour of an equilibrium mechanism being present in the data itself breaks down.



Table 7: The Mixed Test Estimation

	(1) Base Model		(2) Modernization		(3) Institutions; Property Rights		(4) Political Primacy		(5) PROPERTY & POLITICAL RIGHTS EXOGENOUS		(6) GDP & PROPERTY RIGHTS EXOGENOUS	
	CV1	CV2	CV1	CV2	CV1	CV2	CV1	CV2	CV1	CV2	CV1	CV2
	INVRAT	INSTAB	INVRAT	INSTAB	INVRAT	INSTAB	INVRAT	INSTAB	INVRAT	INSTAB	INVRAT	INSTAB
INVRAT	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
INSTAB	2.716e-05	1.00	-4.57e-05	1.00	1.05e-05	1.00	1.14e-005	1.00	9.7e-06	1.00	8.19e-06	1.00
LNRGDP	-5.177	13813	-1.864	8.73e-07	-1.356	13225	-5.9998	3336	-1.37	10185	-0.73	13403
CRIMPOP	0.00	-4.354e+05	0.00	-8.56e-07	0.00	-4.14e+05	0.00	-2.44e+05	0.00	-4e+05	0.00	-4.4e+05
USER	0.016	0.00	-0.004	0.00	0.009	0.00	0.011	0.00	0.008	0.00	-0.0006	0.00
POLRIGHT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PROPRIGHT	-0.077	426.38	-0.021	0.001	-0.016	248.65	-0.069	-461.13	-0.018	-358.68	-0.005	447.35
TREND	0.270	0.00	0.094	0.00	0.071	0.00	0.319	0.00	0.072	0.00	0.036	0.00
ECM1(-1)	-0.02* (0.008)	2300.3 (5567.8)	-0.08* (0.02)	-2857.6 (13240)	-0.06* (0.03)	22200 (18382)	-0.01* (0.005)	3912.8 (3232.9)	-0.07* (0.02)	34565* (16357)	-0.22* (0.05)	-13641 (37921)
ECM2(-1)	8.25e-08 (2.51e-07)	-0.40* (0.18)	-3.84e-06* (1.01e-06)	-0.98** (0.67)	3.95e-07 (3.67e-07)	-0.59* (0.26)	-4.7e-07 (5.5e-07)	-1.19* (0.33)	-1.8e-07 (5.7e-07)	-0.87* (0.37)	9.7e-07 (3.8e-07)	-0.38 (0.27)

Table 8: Imputed Mean Elasticities under the Mixed Test Estimation

	(1) Base Model		(2) Modernization		(3) Institutions; Property Rights		(4) Political Primacy		(5) PROPERTY & POLITICAL RIGHTS EXOGENOUS		(6) GDP & PROPERTY RIGHTS EXOGENOUS	
	CV1	CV2	CV1	CV2	CV1	CV2	CV1	CV2	CV1	CV2	CV1	CV2
	INVRAT	INSTAB	INVRAT	INSTAB	INVRAT	INSTAB	INVRAT	INSTAB	INVRAT	INSTAB	INVRAT	INSTAB
INVRAT												
INSTAB	0.56		-0.94		0.21		0.23		0.20		0.17	
LNRGDP	-23.52	3.07	-8.47	1.94E-10	-6.16	2.93	-27.26	0.74	-6.24	2.26	-3.31	2.97
CRIMPOP		-4.98		-9.80E-12		-4.74		-2.80		-4.58		-5.00
USER	0.90		-0.21		0.47		0.59		0.44		-0.03	
POLRIGHT												
PROPRIGHT	-15.80	4.27	-4.31	8.30E-06	-3.18	2.49	-14.22	-4.62	-3.63	-3.59	-1.10	4.48

For this reason we undertake a last, mixed test of the three mechanisms underlying the determination of political instability. In this we proceed by estimating under the overidentifying restrictions on (5.4) of  $\beta_{25} = \beta_{27} = 0$  in a base model,  $\beta_{25} = \beta_{27} = \alpha_{21} = \alpha_{22} = 0$  for the modernization case,  $\beta_{25} = \beta_{27} = \alpha_{71} = \alpha_{72} = 0$  under political primacy, and  $\beta_{25} = \beta_{27} = \alpha_{61} = \alpha_{62} = 0$  for the case of institutional/property rights primacy. The implication is of an exclusion of political rights as a long run forcing variable in the relationships being estimated. Motivation for the specification comes from Fedderke, De Kadt and Luiz (2001b), who present econometric evidence suggesting that while property rights and political instability were relevant to capital accumulation in South Africa, political rights were an outcome variable of output, not an exogenous variable driving either investment or growth. The mixed test reflects this finding by excluding political rights from the long run specifications as a RHS variable, though it remains present as an outcome variable in the long run levels specification, as well as in the short run dynamics of the system.<sup>28</sup>

Estimation results for the mixed test are reported in Table 7, with the associated implied elasticities at relevant variable mean values reported in Table 8.

The core implication to emerge from the mixed test, is that the implausibly large elasticities found under the weak and some strong test specifications disappear, as soon as the weak exogeneity restriction of the institutional/property rights primacy or the modernization hypothesis cases are imposed. Only for the base model (without exogeneity restrictions - see columns (1) of Tables 7 and 8) or for the political primacy cases (political rights exogeneity restriction - see columns (4) of Tables 7 and 8) do implausibly large elasticities on output reappear.

For the modernization case (GDP exogeneity restriction – see columns (2) of Tables 7 and 8), while the output elasticity in the investment relation is now more plausible (approximately 8.5), the instability relationship effectively dissipates. While statistically coherent, it loses all economic power, in the sense that all three explanatory variables have virtually no meaningful impact on political instability. The implication in our context would be that while structural determinants of political instability could be identified, the changes in output, crime rates and property rights would have to vary very substantially indeed, before any discernible effect on instability would be registered. Moreover, the observed declines in the political instability measure during the 1990's for South Africa would simply not be attributable to the identified explanatory variables of this specification. The problem with the modernization specification therefore is that it fails in its ability to provide explanatory power over crucial test periods of South African institutional development.

---

<sup>28</sup> We also widely tested the alternative specification in which only political rights appears in the instability relationship, while property rights are excluded. The implausibly large elasticities of the weak test uniformly remain present in all these specifications, with output elasticities of approximately 20 in the investment relation, and 10-20 in the instability relationship. Full results available from the authors on request.

Both the political primacy case, as well as the modernization case fail in crucial dimensions, therefore. Political primacy due to an absence of explanatory power. Modernization due to implausibly large impacts attributed to the explanatory variables.

The specification which attributes primacy to institutions/property rights, is the only one to perform satisfactorily.

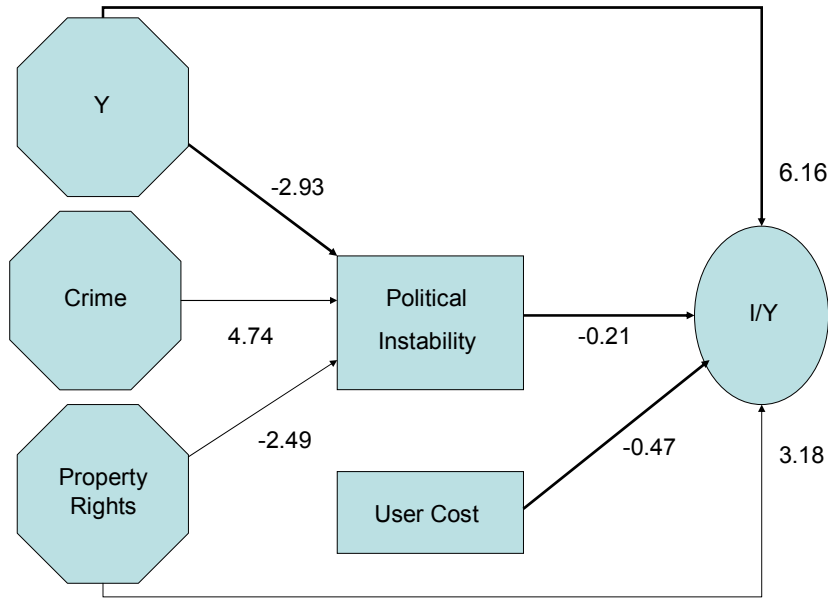
The specification which tests for the primacy of property rights returns plausible elasticities (recall that the relationship between output and investment is that between stock and flow – hence an elasticity of approximately 6 is not entirely implausible), signs of association that accord with priors, and error correction specifications that confirm the presence of error correction. Results are reported in columns (3) of Tables 7 and 8. What is more, the specification which renders property rights weakly exogenous, is robust to additional exogeneity restrictions being imposed on either output or political rights – see for instance columns (5) and (6) of Tables 7 and 8).

On this specification we find standard results for the investment function. Output growth acts as a positive trigger for investment flows (elasticity of 6), the user cost of capita is an investment deterrent (elasticity of 0.5), while improving property rights raise investment expenditure (elasticity of 3.2).

Perhaps the core finding of this study is that the North hypothesis of the primacy of institutions, and property rights in particular, finds the strongest support from our empirical investigation of the determinants of political instability in South Africa. Property rights prove to be important not only in dampening political instability (elasticity of 2.5), but in stimulating investment (elasticity of 3.2). But note that the support for the primacy of property rights comes in weak form, in the sense that rising output also serves to impact on instability. Rising output serves to dampen instability (elasticity of approximately 3), and rising crime rates have an additional strong impact on instability (elasticity of approximately 4). Primacy of the property rights dimension emerges in the weak exogeneity format only, not in the sense that they constitute the sole determinant of instability.

We represent the core findings in schematic form in Figure 1.

**Figure 1: Representation of the relationships of Property Rights Model**



## 6.0 Conclusion

The empirical results of this paper support the findings of previous research in one important respect. We have confirmed that political instability does impact on the aggregate investment rate of South Africa. There is also strong support suggesting that investment is positively related to GDP, and negatively to the user cost of capital.

The important extension of this paper has been a more complete exploration of the role of property rights in investment, and the institutional underpinnings of physical capital accumulation.

Previous examinations of investment under uncertainty only established the importance of political instability to the investment relationship. In this paper we investigated three potentially competing explanations of political instability itself. Modernization theory attributes political instability to the disruption of traditional institutional structures due to economic development. An alternative attributes the primary driver of political instability to the inconsistency and incoherence of the principles that govern a political order. The final explanatory framework attributes primacy to the evolution of property rights specifically, and the broader institutional framework associated with the property rights structure of a society.

Our empirical results find support for both the modernization process, and the primacy of property rights, but relatively little support for the political primacy explanation. Property rights prove to be important not only in dampening political instability, but in stimulating investment. But property rights are not the only determinant of political instability. Both

output and crime rates have an impact on instability. Primacy of the property rights dimension emerges in the weak exogeneity format only, not in the sense that they constitute the sole determinant of instability.

The paper provides important insights into the webs of association between institutions and investment rates. It highlights the significance of getting institutions right to ensure that uncertainty is kept to a minimum by providing a, predictable long term environment. Stability at a systemic level appears crucial if investment rates are to rise in South Africa and this paper demonstrates that stability in turn is driven by a sound institutional environment that has multiple dimensions.

## Appendix A: Data, Variables and Data Sources

INVRAT – ( $I_t$ ) - the net change in fixed capital stock (of machinery and capital equipment) is used as our measure of investment in South Africa.

LNRGDP – ( $Y_t$ ) - the log of real gross domestic product is used as the proxy for the expected return on capital. We expect a positive association with the investment rate.

INSTAB – ( $INST_t$ ) - the logged index of political instability – formulated as a weighed average of eleven measures of political repression and opposition. It covers the period 1935 to 1997. Source: Fedderke, De Kadt and Luiz, (2001a).

USER – ( $UC_t$ ) - the user cost of capital is a proxy for the marginal cost of capital. It has been calculated as the weighted average of the rate of depreciation, the corporate tax rate and the short term interest rate.

PROPRIGHT – ( $PROP_t$ ) - the log of property rights captures the formal property rights of the South African legal framework. The index reflects the freedom to own property, operate businesses and trade internationally etc without undue regulation. Source: Fedderke, De Kadt and Luiz, (2001a).

POLRIGHT – ( $POL_t$ ) - the log of political rights is a subjective index created by Fedderke, de Kadt and Luiz (2001a) and measures political freedom afforded by the government at any point in time. Source: Fedderke, De Kadt and Luiz, (2001a).

CRIMPOP – ( $CR_t$ ) - the number of criminal cases prosecuted and is a measure that indicates the number of criminal cases per unit of population. Source: Fedderke, De Kadt and Luiz, (2001a).

## **References**

- Abel, A.B., 1983, Optimal Investment under Uncertainty, *American Economic Review*, 73(1), 228-33.
- Abel, A.B., and Blanchard, O.J., 1988, The Present Value of Profits and Cyclical Movements in Investment, *Econometrica*, 54(2): 249-73.
- Abel, A.B., and Eberly, J.C., 1994, A Unified Model of Investment under Uncertainty, *American Economic Review*, 84(5), 1369-84.
- Acemoglu, D., 2003, "Root Causes: A Historical Approach to Assessing the Role of Institutions in Economic Development." *Finance and Development*. June, 26-30.
- Aiginger, K., 1987, *Production Decisions under Uncertainty*, Oxford: Basil Blackwell.
- Arrow, K.J., 1968, Optimal Capital Policy with Irreversible Investment, in J.N. Wolfe (ed.) *Value, capital and growth. Essays in honour of Sir John Hicks*. Edinburgh: University Press.
- Bernanke, B.S., 1983, Irreversibility, Uncertainty, and Cyclical Investment, *Quarterly Journal of Economics*, 98, 85-106.
- Bertola, G., and Caballero, R.J., 1994, Irreversibility and Aggregate Investment, *Review of Economic Studies*, 61, 223-46.
- Bromberger, N., 1974, Economic Growth and Political Change in South Africa, in A. Leftwich (ed.), *South Africa: Economic Growth and Political Change*, London: Allison and Busby.
- Bromberger, N., 1978, Economic Growth and Political Change in South Africa: a reassessment, in L. Schlemmer and E. Webster (eds.), *Change, Reform and Economic Growth in South Africa*, Johannesburg: Ravan Press.
- De Kadt, R.H.J., 2001, From Apartheid to Democracy: Logics of Dissolution, in G. Mejia (ed.), *Patterns of Continuity in Democracy and Human Rights in African-Hispanic Encounters*, New Orleans: University Press of the South, 12-25.
- Diamond, L., 1992, "Economic Development and Democracy Reconsidered", *American Behavioural Scientist*, 35(4/5); 450-99.
- Dixit, A and Pindyck, R., 1994 "Investment under Uncertainty", Princeton University Press: Princeton.

Eisner, R. and Strotz, R.H., 1963, "Determinants of business investment, in impacts of monetary policy: A series of research papers prepared for the Commission on Money and Credit" Prentice-Hall, Englewood Cliffs, NJ, 60-233.

Engerman S. and Sokoloff. K., 2003, "Institutional and non-institutional explanations of economic differences" National Bureau of Economic Research Working paper 9989, <http://www.nber.org.papers.w9989>.

Fedderke, J.W., 1997, Political and Social Dimensions of Economic Growth, *Theoria*, 89, pp 1-42.

Fedderke, J.W., 2001 "Investment in Fixed Capital Stock: The South African Manufacturing Industry 1970-1997" *ERSA Working Paper #16* – <http://www.wits.ac.za/economics/ersa>.

Fedderke, J. W., 2004 "Investment in Fixed Capital Stock: Testing for the Impact of Sectoral and Systemic Uncertainty." *Oxford Bulletin of Economic and Statistics*, 66(2), 165-188.

Fedderke, J.W., de Kadt, R. and Luiz, J.M., 2001a, "Indicators of Political Liberty, Property Rights and Political Instability in South Africa", *International Review of Law and Economics*, 21(1), 103-34.

Fedderke, J.W., De Kadt, R.H.J., and Luiz, J., 2001b, Growth and Institutions: a study of the link between political institutions and economic growth in South Africa - a time series study, 1935-97, *Studies in Economics and Econometrics*, 25(1), 1-26.

Fedderke, J.W. and Klitgaard, R., 1998, "Economic growth and social indicators: an exploratory analysis", *Economic Development and Cultural Change*, Volume 46, Number 3, pg 455-489.

Ferderer, J.P., 1993, The Impact of Uncertainty on Aggregate Investment Spending: An Empirical Analysis, *Journal of Money, Credit and Banking*, 25(1), 49—61.

Fielding, D., 1997, "Aggregate Investment in South Africa", *Oxford Bulletin of Economics and Statistics*, 59, 89-107.

Fielding, D., 1999, "Manufacturing Investment in South Africa: A Time Series Model" *Journal of Development Economics* vol. 58, pp. 405-28.

Greenslade, J., Hall, S.G., and Henry, S.G.B., 1999, On the Practical Identification of Cointegrated Systems with an application to UK Wage and Price Setting, Paper presented at the African Econometrics Society Conference 1999.

Hayashi, F., 1982, Tobin's Marginal and Average q, *Econometrica*, 50(1), 213-24.

- Henderson, S., 2004, *An examination of investment under uncertainty and the determinants of uncertainty: the application of a VECM structure on South Africa*, Unpublished M.Comm Dissertation, University of the Witwatersrand.
- Huntington, S.P. 1968, *Political Order in Changing Societies*, New Haven: Yale University Press.
- Huntington, S.P., 1984, Will More Countries Become Democratic? *Political Science Quarterly*, 99, 193-218.
- Huntington, S.P., 1991, Democracy's Third Wave, *Journal of Democracy*, 2, 12-34.
- Johansen, S., 1988, Statistical analysis of cointegrating vectors, *Journal of Economic Dynamics and Control*, 12, 551-70.
- Johansen, S, 1991, "Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models", *Econometrica*, 59(6), 1551-1580.
- Johansen, S, and Juselius, K, 1990, "Maximum Likelihood Estimation and Inference on Cointegration – with applications to the demand for money", *Oxford Bulletin of Economics and Statistics*, 52(2), 169-210.
- Johansen, S., and Juselius, K., 1992, Testing structural hypotheses in a multivariate cointegrating analysis of the PPP and the UIP for UK, *Journal of Econometrics*, 53, 211-44.
- Jorgenson, D.W., 1963, Capital Theory and Investment Behavior, *American Economic Review*, May: 247-59.
- Kularatne,C, 2002, "An examination of the impact of financial deepening on long-run economic growth: An application of VECM structure to a middle-income country context" *South African Journal of Economics*, 70(4), 647-687.
- Lipset, S.M., 1959, Some Social Requisites of Democracy: Economic Development and Political Legitimacy, *American Political Science Review*, 53, 69-105.
- Luiz,J.M., 2001, "Temporal Association, the Dynamics of Crime, and their Economic Determinants: A Time Series Econometric Model of South Africa." *Social Indicators Research*. 53, 33-61.
- Luiz,J.M., 2005, *Institutions and Economic Performance: Implications for African Development*. Unpublished mimeo University of the Witwatersrand.
- Mariotti, M, 2002, "An examination of the impact of Economic policy on long run economic growth: an application of a VECM structure to a middle-income context." *South African Journal of Economics*, 70(4), 688-724.

McDonald, R., and Siegel, D., 1986, The Value of Waiting to Invest, *Quarterly Journal of Economics*, 101, 707-27.

Muller, E.N., 1997, Economic Determinants of Democracy, in M.I. Midlarsky (ed.), *Inequality, Democracy, and Economic Development*, Cambridge: University Press.

Mussa, M., 1977, External and Internal Adjustment Costs and the Theory of Aggregate and Firm Investment, *Econometrica*, 29(3), 632-49.

Nickell, S.J., 1978, *The Investment Decisions of Firms*, Cambridge: University Press.

North, D., 1990, *Institutions, Institutional Change, and Economic Performance*. New York: Cambridge University Press.

O'Dowd, M., 1974, South Africa in the Light of the Stages of Economic Growth, in A. Leftwich (ed.), *South Africa: Economic Growth and Political Change*, London: Allison and Busby.

O'Dowd, M., 1978, The stages of economic growth and the future of South Africa, in L. Schlemmer and E. Webster (eds.), *Change, Reform and Economic Growth in South Africa*, Johannesburg: Ravan Press.

Pesaran, M.H., and Shin, Y., (1995a) Long run structural modelling, Unpublished manuscript, University of Cambridge.

Pesaran, M.H., and Shin, Y., (1995b) An autoregressive distributed lag modelling approach to cointegration analysis, *DAE Working Paper no 9514*, Department of Applied Economics, University of Cambridge.

Pesaran, H, Shin, Y, Smith, R., 1996, "Testing for the existence of a long run relationship", *Unpublished manuscript, University of Cambridge*.

Pindyck, R.S., 1988, Irreversible Investment, Capacity Choice, and the Value of the Firm, *American Economic Review*, 78(5), 969-85.

Pindyck, R.S., 1991, Irreversibility, Uncertainty, and Investment, *Journal of Economic Literature*, 29(3), 1110-48.

Rawls, J., 1971, *A Theory of Justice*, Oxford: University Press.

Sen, A., 1999, *Development as Freedom*, New York: Alfred A. Knopf.

Sensenbrenner, G. 1991, Aggregate Investment, the Stock Market, and the q-model: Robust results for six OECD countries, *European Economic Review*, 35(4): 769-832.

Taylor, C., 1985, Kant's Theory of Freedom, in C. Taylor, *Philosophy in the Human Sciences: Philosophical Papers II*, Cambridge: University Press.

Tobin, J., 1969, A General Equilibrium Approach to Monetary Theory, *Journal of Money, Credit and Banking*, 1, 15-29.

Tobin, J., and Brainard, W.C., 1968, Pitfalls in Financial Model Building, *American Economic Review*, May, 58, 99-122.

Tobin, J., and Brainard, W.C., 1977, Asset Markets and the Cost of Capital, in B.Balassa and R.Nelson (eds.), *Economic Progress, Private Value, and Public Policy*, New York: North Holland, 235-62.

Wickens, M.R., Interpreting cointegrating vectors and common stochastic trends, *Journal of Econometrics*, 74 (1996), 255-71.

Wood, E.J., 2000, *Forging Democracy from Below: Insurgent Transitions in South Africa and El Salvador*, Cambridge: University Press.