EXPLORING THE NEXUS BETWEEN BANK COMPETITION AND PRODUCTIVITY IN THE SOUTH AFRICAN BANKING SECTOR

ANDREW MAREDZA[*], FORGET KAPINGURA[†] & SYDEN MISHI[†]

ABSTRACT

The paper investigates the relationship between bank competition and productivity in the South African banking sector, employing the GMM method for the period 2002 Q1 to 2009 Q4. Empirical results indicate that there is a positive relationship between our measure of competition (HHI) and Total factor Productivity. Therefore, because of larger size and stronger capital base, lending by bigger banks continue to increase their output and hence productivity regardless of the monetary policy stance by the reserve bank or economic outlook.

Key Words:

Competition; Data Envelopment Analysis; Hicks-Moorsteen; Herfindahl-Hirschman; Panel data; South African Banking; Total Factor Productivity Efficiency

JEL Classification: C14, G21, D4, O11, O17, O40, O43, O47

[*] School of Economic & Decision Sciences, North West University, South Africa.
E-mail: Andrew.Maredza@nwu.ac.za

† Economics Department, University of Fort Hare, East London, South Africa,
E-mail 1: FKapingura@ufh.ac.za *Email 2*: SMishi@ufh.ac.za

1. INTRODUCTION

Establishing the competitiveness and efficiency of the banking sector has attracted considerable attention both at the academic and policy discourse (Mlambo & Ncube, 2009; Biekpe, 2011; Maredza & Ikhide, 2012). Competition is regarded as an important ingredient in any industry as it promotes innovation. However, studies on the link between bank competition and productivity are still at their infancy. Thus this study seeks to examine the nexus between competition and productivity of the South African banking sector.

The South African banking-sector is dominated by the four largest banks, which contribute over 84 per cent to the balance-sheet size of the banking sector, explaining the current high concentration within the industry calculated using the Herfindahl-Hirschman Index. The higher the index, the lesser is the competition that exists in the market. An H-H index below 0.1 indicates that there is no concentration in an industry, while an H-H index between 0.1 and 0.18 is an indication of moderate concentration.

The South African Reserve Bank Annual Reports, from 1994 to 2011 shows that the South African banking sector H-H index amounted to over 0.18 since 2004, and was never below 0.1 over the period under review. An H-H index above 0.18 represents a highly concentrated industry that indicates the presence of oligopoly behaviour and this is the case of the South African banking sector.

Thus this study seeks to analyse bank performance in South Africa measured in terms of total factor productivity growth, accounting for the effects of competition. The rest of the paper is organised as follows. Section 2 presents an overview of the South African banking sector. Section 3 presents a selective review of relevant theoretical and empirical literature on the nexus between bank competition and productivity. Section 4 provides the methodology employed in the study. Section 5 econometric procedure and results, whilst Section 6 draws conclusions.

2. THE STRUCTURE OF THE SOUTH AFRICAN BANKING INDUSTRY

The South African banking sector is developed and well regulated. It compares favourably with those of industrialised countries. A report by the Banking Association South Africa indicates that the banking sector has undergone a lot of changes in the past years. The report further shows that the industry is made up of 19 registered banks, 2 mutual banks, 13 local

branches of foreign banks, and 43 foreign banks (Banking Association of South Africa (BASA), 2011).

Though there are many banks in South Africa, the four major banks (ABSA, FirstRand, Nedbank and Standard Bank) represent about 84 percent of total banking assets as of June 2010. Standard bank is the largest bank in terms of assets, with a market share of 26 percent, followed by ABSA with 22 percent. FirstRand and Nedbank had a market share of about 19 percent and 18 percent respectively. This indicates that competition in the South African banking sector is not even (BASA, 2011).

Irrespective of the structure of the banking sector in South Africa, Mlambo and Ncube indicate that the South African banks dominate the African landscape. As of 2008 the banks in South Africa accounted for 40.4 percent of the total banking asserts, 34.6 per cent of net earnings, 49.9 per cent of bank credit, and 42.4 per cent of bank deposits. Maredza and Ikhide (2012) also shows that total banking-sector assets in South Africa amounted to R3406 billion at the end of December 2011, which is an 8.9% increase from 2010.

3. LITERATURE REVIEW

3.1 Conceptualizing Productivity

O`Donnell et al (2011) defines productivity and efficiency as distinct but related concepts that relates to the ability of a production unit to transform a set of inputs into a set of outputs. Total factor productivity (TFP) is the ratio of *total* output to *total* inputs. It is important to underline that TFP is a broader concept compared to partial productivity given that it takes into consideration the specific combination of inputs used in the production process. On the other hand, partial productivity simply looks at the contribution of a single input factor to output and fails to take into account the substitutability among input factors. In this paper, we adopt the total factor productivity concept as opposed to partial productivity. In the singe-output and single-input setting, productivity is simply the ratio of that bank`s output and input quantity. In real world cases where a bank produces several outputs using several inputs, TFP is measured as the ratio of an aggregate output to an aggregate input (O`Donnel, 2010a).

Let's suppose for example that $x_{it} = (x_{1it},...,x_{Kit})'$ and $y_{it} = (y_{1it},...,y_{Jit})'$ denote the input and output quantity vectors of bank *i* in period *t*. Then the TFP of the bank is simply:

$$TFP_{it} = \frac{Y_{it}}{X_{it}} \tag{1}$$

Where $Y_{it} = Y(y_{it})$ is aggregate output and $X_{it} = X(x_{it})$ is aggregate input. *Y* (.) and *X* (.) are non-negative, non-decreasing and linearly homogeneous aggregator functions. O`Donnell (2011) then formulated the associated index number that measures the TFP of bank *i* in period *t* relative to bank *h* in period *s* as:

$$TFP_{hs,it} = \frac{TFP_{it}}{TFP_{hs}} = \frac{Y_{it} \big/ X_{it}}{Y_{hs} \big/ X_{hs}} = \frac{Y_{it} \big/ Y_{hs}}{X_{it} \big/ X_{hs}} = \frac{Y_{hs,it}}{X_{hs,it}} \tag{2}$$

Where $Y_{it} = Y_{it} \big/ Y_{hs}$ is an output quantity index and $X_{it} = X_{it} \big/ X_{hs}$ is an input quantity index. Thus TFP growth can be expressed as a ratio of output growth over input growth where positive TFP growth from period *s* to period *t* is indicated by value greater than unity.

3.1.1 The Hicks-Moorsteen TFP Index

Literature on bank productivity measurement is rich with studies that analysed productivity using the Malmquist index approach which recent developments has shown is multiplicatively incomplete. O`Donnell (2011) states that different aggregator functions give rise to different TFP indexes such as the Laspeyres, Paasche, Fisher, Lowe, Malmquist, Fare-Primont and the Hicks-Moorsteen. The Hicks-Moorsteen output and input aggregator functions are $Y(y) = [D_O(x_{hs}, y, s) D_O(x_{it}, y, t)]^{1/2}$ and $X(x) = [D_I(x, y_{hs}, s) D_I(x, y_{it}, t)]^{1/2}$ respectively. When these are substituted in equation (1) and (2) specified above, they give rise to the Hicks-Moorsteen TFP index:

$$TFP_{hs,it} = \left(\frac{D_O(x_{hs}, y_{it}, s)}{D_O(x_{hs}, y_{hs}, s)} \frac{D_I(x_{hs}, y_{hs}, s)}{D_I(x_{it}, y_{hs}, s)} \frac{D_O(x_{it}, y_{it}, t)}{D_O(x_{it}, y_{hs}, t)} \frac{D_I(x_{hs}, y_{it}, t)}{D_I(x_{it}, y_{it}, t)} \right)^{1/2} \tag{3}$$

Where y_0 and x_0 are vectors of quantities and D_O (.) and D_I (.) are Shepherd`s (1953) output and input distance functions. Formulation (3) above was first proposed by Bjurek (1996) but is commonly known as the Hicks-Moorsteen index. O'Donnell (2011) states that it is called as such because it is the geometric average of two indexes that Diewert (1992) attributed to Hicks (1961) and Moorsteen (1961). O'Donnell (2011a) describes TFP indexes that can be

expressed in terms of aggregate quantities as in equation (2) as being *multiplicatively-complete*. However, unlike the Hicks-Moorsten TFP Index, the popular Malmquist TFP index is not included among the class of multiplicatively complete TFP indexes. Thus O`Donnell (2010a, 1) argues that for this reason it cannot be regarded as a valid measure of productivity change except under constant returns to scale technology. Grifell-Tatje and Lovell (1995) also showed that the Malmquist is best suited for constant returns to scale technologies and that with varying returns to scale the Malmquist productivity index does not precisely measure productivity change. Coelli and Rao (2005) also reached the same conclusion that without constant returns to scale (CRS), the results of calculating the Malmquist TFP index may incorrectly measure TFP changes arising from scale economies.

In a South African study of commercial banks, Maredza and Ikhide (2013) utilised the Hicks-Moorsteen TFP index approach over the Malmquist approach to analyse efficiency and total factor productivity changes during the period of the global financial crisis. In this paper, we adopt the same TFP index technique to explore the nexus between competition and productivity of the South African banking sector. Although there are a number of empirical studies in South Africa that have examined competition and bank efficiency, little has been done to investigate the relationship between competition and bank total factor productivity. This paper is a pioneering work in this regard. The subsequent section will review previous studies on competition and bank efficiency in South Africa.

3.2 Brief Review of Empirical Literature

Mlambo and Ncube (2011) states that competition reduces monopoly rents, prices and operational costs at which financial services are offered resulting in welfare gains for the public. This subject is critical in South African banking where the four largest banks in the country account for over 80% of total banking assets. A World Bank (2007) study also identified that lack of competition in banking is one of the aspects that is related to low efficiency of commercial banks in Africa. The study noted that interest spreads, profits and overhead costs are high in African banking. Napier (2005) observed that South African banks operate as a complex monopoly, with perceived high barriers to entry. Okeahalam (2000) argues that the presence of an oligopoly structure imply that the level of competition required to induce efficiency improvements may not exist. Mlambo and Ncube (2009) also found that for the period 1999–2008, the structure of the South African banking industry was characterised by monopolistic competition.

A high level of market concentration raises the obvious question of whether efficiency and productivity is being achieved in South Africa. In addition to ensuring improved efficiency in the production of quality financial services, Claessens and Laeven (2003) added that competition matters for access to financial services by both firms and households. On the contrary, Petersen and Rajan (1995) hold the view that market power in banking may be to an extent beneficial for access to financing. Hence the view that competition is undeniably good in banking may not be so welcome in other economies. Edward and Mishkin (1995) also concur that while a competitive environment may induce efficiency, it may also increase risk taking activities through engaging in non-traditional banking activities as banks seek to maintain their market shares. Maredza and Ikhide (2013) found that diversification practices which often occur in a highly competitive environment were negatively affecting the efficiency and productivity of South African banks. Their sample consisted of a panel of the largest four South African banks which although account for over 80% of the total banking assets may have been competing aggressively against each other. Greenberg and Simbanegavi (2009) also found evidence of competition among the largest four banks of South Africa. On the contrary, the authors found small banks to face less competition due to the market power they exercise on the niche markets they serve.

Okeahalam (2001) adopted the structure conduct performance (SCP) framework for the period 1997 to 1999 to assess the degree of concentration in South African banking sector. The SCP framework implies that a higher level of concentration leads to higher prices which in turn lead to higher profits. On the demand side, higher prices acts as a brake on efforts designed to increase productivity and access to banking services. Results from their estimated model indicated that the South African banking sector was highly concentrated and characteristic of collusive oligopolistic behaviour. They noted that high concentration raises the likelihood of collusive oligopoly behaviour with the associated negative consequences for the consumer. Of particular interest to this study was the view that collusion leads to comfortable returns and reduces the incentive for banks to seek markets that are considered difficult.

Greenberg and Simbanegavi (2009) employed the Panzar-Rosse (1987) approach and the Bresnahan model (1982) to determine the level of competition in South Africa`s banking sector for the period 1998 to 2007. They noted that there are efficiency implications if the banking sector is not competitive. In order to account for possible heteroscedasticity, the

authors conducted the Panzar-Rosse test on small, large and on all banks collectively. They found that with regard to interest income, the South African banking sector was highly competitive with an H-statistic of 0.7475 which was not significantly different from 1. The obtained results also revealed that large banks with an H-statistic of 0.9672 operated under conditions consistent with perfect competition while small banks were characteristic of monopolistic competition exhibiting an H-statistic of 0.5795. They justified their interesting findings arguing that small banks mainly operate in geographically segmented markets where they tend to serve niche markets allowing them to exercise market power. On the contrary, large banks in South Africa operated at a national and international scale where the competition is aggressive. Finally, results obtained from the Bresnahan model also supported their initial results that the South African banking sector was characterised by a high level of competition.

Another study of competition was conducted by Mlambo and Ncube (2011) who analysed the evolution of competition and efficiency of the banking sector in South Africa using firm-level data for the period 1999 -2008. Their study investigated the relationship between market structure and efficiency. Their point of departure was that competition forces banks to reduce cost-inefficiencies and may result in welfare gains for the public. The data set consisted of a panel of 26 domestic and foreign banks. The methodology adopted was the variable returns to scale (VRS) input-oriented Data Envelopment Analysis (DEA). The intermediation approach was used to determine the choice of inputs and outputs. The input variables used were staff costs and deposits with loans and advances as the output variables. The Panzar-Rosse results obtained revealed an H-statistic of 0.57 showing that the market structure of the banking industry was monopolistic competition. However, the Panzar-Rosse model was re-estimated with the DEA efficiency score included among the independent variables. Casu and Girardone (2006) justify the inclusion of DEA efficiency score on the grounds that it can be taken as a proxy for managerial ability. Managerial ability came out as an important factor for bank efficiency. The estimated H-statistic increased slightly to 0.575 from the previous 0.57. Their conclusion was that competition was a crucial determinant of bank efficiency and that the structure of the banking industry was characterised by monopolistic competition.

The above empirical literature review has highlighted previous work conducted in South African banking on various issues surrounding market structure and bank efficiency. However, the importance of this paper is twofold. Firstly we seek to provide understanding to

the debate of whether competition promotes productivity within the South African banking sector. Secondly, in this paper we use the Hicks-Moorsteen TFP index approach to address the limitations rooted in the popular Malmquist TFP index approach. Hence, this paper applies this methodology to explore the nexus between competition and productivity of the South African banking system.

4. THEORETICAL FRAMEWORK AND MODEL SPECIFICATION

4.1. Conceptualising competition in banking sector

The common measure of competition which is also used by the SARB for competition in the South African banking sector is the HH-Index for concentration. Market concentration measures the extent to which market power is likely to be pronounced in a single supplier, or group of suppliers.

OECD, (2010) noted that measuring competition in financial markets is complex due to their peculiar features, such as switching costs. OECD then identifies three approaches that have been used to measure competition in the banking sector, as follows:

i. ***Structural measures of competition***

The widely used measures in empirical work are concentration ratios, the number of banks and the Herfindahl-Hirschman index (HHI). These measures originated in the structure-conduct-performance (SCP) paradigm linking the structure of a market to influences on firm behaviour and thus sector performance. One prediction of the SCP approach is that higher concentration would encourage collusion and reduce efficiency. The challenge however, is that there is no consensus on the best variable for measuring market structure in banking, while performance is typically measured with variables, such as net interest margins or profitability, which can be influenced by factors other than the degree of competition, such as a country‘s macroeconomic situation or the level of taxation.

ii. ***Measures of market contestability***

This approach assesses competitive conditions in terms of contestability. Variables like regulatory indicators of entry requirements, the presence of foreign ownership, formal and informal entry barriers and activity restrictions measure the threat of entry in the sector and thus its contestability through the degree of entry and exit.

iii. ***Direct measures of competition: The H-statistic***

The third approach measures the intensity of competition directly, in the way prices or outputs respond to costs. Most recent studies of banking use the so-called H-statistic, based on the Panzar and Rosse methodology, which proxies the reaction of output to input prices. The H-statistic is calculated by summing the estimated elasticities of revenue to factor prices; a value of one indicating perfect competition, a value of zero (or less) indicates monopoly and intermediate values indicate the degree of monopolistic competition. Other studies use the Lerner index, which expresses market power as the difference between the market price and the marginal cost divided by the output price. The index ranges from a high of 1 to a low of 0, with higher numbers implying greater market power.

Despite that theoretical foundation for direct measures is stronger than for structural measures, direct measures have drawbacks. For instance, the H-statistic imposes restrictive assumptions on banks' cost functions. Its conclusion that increases in input prices make total revenue and marginal costs not to move together in imperfectly competitive markets is only valid if the industry is in equilibrium, which in practice is very rarely the case. Its single measure neglects differences among banks like size (which is of great concern in South Africa), product or geographic differentiation. The Lerner index is a better way to distinguish among the different products, but it has the problem that it requires information on prices and marginal costs, which is very difficult to gather. For reasons highlighted here, we adopt the SCP approach and model HHI for the South African banking sector, with data available from the SARB annual reports.

4.2 Estimation Techniques

We employ a two stage methodology framework in our investigation. In the first stage, the Hicks-Moorsteen total factor productivity (TFP) indices are computed. In the second stage, the obtained TFP indices become the dependant variable and an empirical model is specified to examine the magnitude of the significance and direction of the impact of the degree of competition on productivity. To compute bank TFP indexes, we employ DPIN 3.0, a program for computing and decomposing productivity index numbers. O`Donnell (2011) states that DPIN uses DEA linear programs to estimate levels of productivity and efficiency and subsequently decomposes changes in productivity into measures of technical change, technical efficiency change, scale efficiency change and mix efficiency change. The program handles a variety of TFP indexes namely Laspeyres, Paasche, Fisher, Lowe, Malmquist,

Hicks-Moorsteen, and Fare-Primont. A comprehensive account of each of the TFP index is found in the work of O`Donnell (2011). As stated earlier, we apply the Hicks-Moorsteen index approach for reasons outlined in the previous section. Moreover, the computation of the Hicks-Moorsteen TFP index does not rely on availability of price data and does not require any assumptions regarding the degree of competition in product markets or the optimizing behaviour of firms (O`Donnell, 2011).

We also adopt in our paper the model that was used by Brissimis et al (2008) to study the relationship among bank performance, competition, bank sector reform, and risk-taking in banking. We perform this second stage analysis in order to determine factors that influence bank productivity as well as the size of their marginal effects. Of particular significance to the present study is to ascertain whether the degree of competition plays any role in influencing positive productivity of banks in South Africa. We therefore specify the modified empirical model as:

$$TFP_{t} = \alpha_0 + \alpha_1 HHI_t + \alpha_2 \phi_{it} + \alpha_3 \chi_t + \varepsilon_t$$

Where total factor productivity, TFP, of all banks is a function of an index for capturing industry market power, HHI ; a vector of bank specific variables that denotes size and capital adequacy, ϕ ; vector of macroeconomic variables common to all banks, χ ; α is a vector of coefficients to be estimated; and the error term ε.

We were able to employ GMM estimation techniques due to the panel nature of our data and the advantages of GMM over other panel estimation techniques. Mishi and Tsegaye (2012) noted that, providentially, this method accounts for the potential endogeneity of some variables, which is likely in some of our variables like bank specific series. The instruments for the lagged dependent variable are their own lagged values in levels with a one-lag window. This is highly crucial in panel studies as it also generates efficient estimates in the presence of heteroskedasticity of unknown form. According to Baum et al. (2003) the usual approach today when facing heteroskedasticity of unknown form is to use the GMM, introduced by Hansen (1982). Baum further argued that, GMM makes use of the orthogonality conditions to allow for efficient estimation in the presence of heteroskedasticity of unknown form. Carrera, (2011) argued that the differencing procedure ensures efficiency and consistency of the estimates, provided that instruments are adequately chosen to take into account the serial correlation properties of the model.

4.3 Data Definition

The input and output data for the first stage analysis were collected from published annual reports of banks for the period 2000 to 2009. The sample consists of five banks, four largest and one small South African commercial banks categorized according to the size of assets. The large banks whose total combined assets account for 855 of sector assets, included ABSA, FirstRand Bank, Nedbank and Standard Bank. The small bank included is African Bank, randomly selected. When defining the inputs and outputs to be adopted two basic approaches are followed: the production approach and the intermediation approach. In this paper, the intermediation approach is adopted. The intermediation approach views banks as intermediary institutions that accept deposits to produce the outputs which are loans and advances. Many empirical studies on bank performance measurement prefer the intermediation approach [Maredza & Ikhide (2013) in South Africa; Mlambo & Ncube (2011) in South Africa; Kamau (2009) in Kenya; Frimpong (2010) in Ghana, 2011]. Labour, fixed assets, deposits and current accounts, are considered inputs while loans and advances are considered as output variables. In this study outputs were represented by loans and advances while total deposits proxy input. These variables and their descriptive statistics are presented in Table 1 and 2 respectively. Data that was used in the second stage analysis was obtained from two sources within the Quantec data base. These sources include SARB and Bureau for Economic Research (BER), collected for the period 2002 to 2009. Descriptive statistics for the second stage variables are presented in Table 3.

5. ECONOMETRIC PROCEDURE AND RESULTS

The descriptive statistics in table 4.1 indicates that on the selected variables, GDP has the highest mean value whilst CPT has the lowest. As for the standard deviation the results indicates that GDP is the most volatile whilst CPT is least volatile. From the J-B results, all series except TFP and HHI are normally distributed.

Panel Generalized Method of Moments Results

$$TPF_t = -2.92E\text{-}07GDP_t + 5.842076HHI_t - 0.006575P + 0.010645RR_t + 0.006575SZ_{it} + 0.106924CPT_{it}$$

se	**=**	**(3.58E-08)**	**(5.842076)**	**(-0.006575)**	**(0.010645)**	**(0.000618)**	**(0.023542)**
t	**=**	**[-8.159360]**	**[7.156068]**	**[-10.74494]**	**[9.927614]**	**[10.64599]**	**[4.541786]**
p value	**=**	**(0.0000)*****	**(0.0000) *****	**(0.0000) *****	**(0.0000)*****	**(0.0000)*****	**(0.0000)*****

R^2 = 0.999408; Adjusted R^2 = 0.999404; J-Statistic 19.54426

The coefficient of focus α_1 reveals a positive relationship between TFP and HHI, this therefore suggests that concentration does play a role as far as productivity is concerned in South Africa banking sector. However we need to take into account that we considered data for the four major banks, in the event that we include all banks in the industry the result may be different. Productivity measure is populated by total factor productivity of the big four banks hence less competition (higher concentration) give the bigger banks room to increase productivity, possibly due to an increase in the volume of loans and advances made. Because of larger size and stronger capital base, lending by bigger banks continue increasing their output and hence productivity regardless of the monetary policy stance by the reserve bank or economic outlook. This is so because, the structure of the South African banking sector is crucial. This is supported by Mishi and Tsegaye (2012) who concluded that size do appropriately discriminate banks in South Africa according to their external finance cost and that big banks have enough resources to cushion monetary policy tightening.

Overall, the empirical results indicate that all variables are highly significant. There is a negative relationship between GDP and TFP which is the measure of productivity. This result is not consistent with the apriori expectation and theory; this may be due to an increase in loans which at times are not competitive when the economy is growing. The relationship between TFP and P, which is a measure of inflation in consistent with the apriori expectation and theory and inflationary pressures have a negative effect on bank productivity. Also, there is a positive relationship between size of the bank; capitalization and productivity. However, the relationship between TFP and the repo rate is not consistent with theory and apriori expectation.

6. CONCLUSION

The study investigated the relationship between productivity and competition in South Africa. The empirical results indicate that there is a positive relationship between HHI, the measure of competition and TFP which is the measure of productivity. This implies that though the South African banking sector is dominated by the big four, the sector is productive. However it is important to note that we only focused on data for the big four banks. Therefore, the result of this study maybe improved by looking at a study which takes into account the behaviour of all the banks in the South African banking sector.

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8. APPENDICES

Table 1: Variables Used in Efficiency and Productivity Analysis.

VARIABLE	**DEFINITION**
OUTPUTS	
Y_1	Advances and Loans[1]
INPUTS	

[1] According to Banking Supervision Department SARB (2010), loans and advances represented on average, 74 per cent of banking sector total assets during 2010.

X_3	Deposits

Table 2: Descriptive Statistics: First stage Variables

	TFP_	SZ_	RR_	P_	HHI_	GDP_	CPT_
Mean	0.980625	5.609237	9.671875	6.281250	0.169375	402600.4	0.072785
Median	1.060000	5.602172	9.750000	6.000000	0.180000	401876.6	0.075440
Maximum	1.080000	5.849928	13.50000	13.40000	0.190000	462569.7	0.087179
Minimum	0.260000	5.357334	7.000000	0.400000	0.040000	333305.6	0.048570
Std. Dev.	0.232933	0.178616	2.006479	3.569172	0.041809	40701.78	0.010353
Skewness	-2.757748	0.000466	0.212437	0.215492	-2.651487	-0.067065	-0.793538
Kurtosis	8.673046	1.492891	1.883469	2.233764	8.344825	1.593073	2.923102
Jarque-Bera	83.47219	3.028503	1.902878	1.030485	75.58490	2.663245	3.366296
Probability	0.000000	0.219973	0.386185	0.597356	0.000000	0.264049	0.185788
Sum	31.38000	179.4956	309.5000	201.0000	5.420000	12883212	2.329110
Sum Sq. Dev.	1.681988	0.989017	124.8047	394.9088	0.054188	5.14E+10	0.003323
Observations	32	32	32	32	32	32	32

Table 3: Panel Generalized Method of Moments Results

Dependent Variable: TFP_
Method: Generalized Method of Moments
Date: 02/22/13 Time: 11:55
Sample: 1 800
Included observations: 800
Linear estimation with 1 weight update
Estimation weighting matrix: HAC (Bartlett kernel, Newey-West fixed bandwidth = 7.0000)
Standard errors & covariance computed using estimation weighting matrix
Instrument specification: TFP_-1 GDP_-1 HHI_-1 P_-2 RR_-1 SZ_-2 CPT_-1
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP_	-2.92E-07	3.58E-08	-8.159360	0.0000
HHI_	5.842076	0.033268	175.6068	0.0000
P_-1	-0.006575	0.000612	-10.74494	0.0000
RR_	0.010645	0.001072	9.927614	0.0000
SZ_-1	0.006576	0.000618	10.64599	0.0000
CPT_	0.106924	0.023542	4.541786	0.0000

R-squared	0.999408	Mean dependent var	0.196125
Adjusted R-squared	0.999404	S.D. dependent var	0.405682
S.E. of regression	0.009903	Sum squared resid	0.077863
Durbin-Watson stat	0.907722	J-statistic	19.54426
Instrument rank	8	Prob(J-statistic)	0.000057