CORPORATE PROFITABILITY AND THE DYNAMICS OF COMPETITION IN EMERGING MARKETS: A TIME SERIES ANALYSIS

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by

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Abstract
The paper presents time-series analyses of corporate profitability in seven leading developing countries (DCs) using the common methodology of the persistence of profitability (PP) studies and systematically compares the results with those for advanced countries (ACs). Surprisingly, both short- and long-term persistence of profitability for DCs are found to be lower than those for ACs. The paper concentrates on economic explanations for these findings. It also reports the results on the persistence of the two components of profitability - capital-output ratios and profit margins. These too raise important general issues of economic interpretation for PP studies which are outlined.

Keywords: Competition, profitability, persistence, emerging markets

JEL Codes: G30, L10, D4, F02

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I. Introduction

This paper examines empirically the dynamics of the competition process in product markets in emerging economies, using the common methodology of "the persistency of profitability" (PP) studies in industrial organization. This methodology has been applied extensively, mainly to advanced countries (ACs)[1]. Time series analyses of profitability persistence in seven leading developing countries (DCs), Brazil, India, Jordan, Korea, Malaysia, Mexico and Zimbabwe are reported here for 339 firms generally spanning the period 1980 to 1995.

The paper is a sequel to Glen, Lee and Singh (2001), henceforth GLS, which suggested that the persistency coefficients for the above sample DCs were generally smaller than those observed for ACs.[2] This could normally be taken to indicate that the intensity of competition in DCs is more, and certainly not less, than that observed for the latter countries. It is a counterintuitive finding as DC markets are conventionally regarded as lacking in competition. As Singh [2002] notes that there is *prima facie* a solid basis for such thinking. There are a range of structural factors which are inimical to competition in DCs including government created barriers to entry and exit, small and segmented markets, infra-structural and transportation deficits. These raise the question whether the persistency results for DCs need a different economic interpretation from those for ACs. A satisfactory answer to this question would requires a full discussion of all the parameters of the reduced form auto-regressive equation normally used in PP studies and not just the short-term persistency coefficients that received most attention in GLS. All these parameters and their correlations have important implications for competition dynamics. One central focus of this paper is therefore economic explanations for the comparative results regarding intensity of competition, both between developing and advanced countries and between developing countries themselves.

However, in conducting these empirical exercises the paper also includes an econometric methodology not previously employed in PP studies. Most research in this genre has either not undertaken unit root analysis or has arrived at inconclusive results owing to the low power of the tests used. Goddard and Wilson (1999) and Kambhampati (1995) cannot reject the unit root hypothesis in the vast majority of cases using standard methods. This creates difficulties for the statistical and economic interpretation of empirical results in PP studies. We overcome these problems by using the more powerful Im-Pesaran test that, by exploiting the panel structure of the data, allows us to reject non-stationarity of profitability.

The paper's second main focus comprises analyses of the persistency of two components of profitability: the profit margin (the ratio of profits to sales) and capital productivity (the output/capital ratio).[3] This exercise, not carried out previously either for advanced or developing countries, is important in its own right but its results also have a bearing on the classic Demsetz (1974, 1989) conundrum of whether the superior profitability of large firms is due to their greater efficiency or to greater market power. This issue is addressed here by investigating whether there is greater persistency of monopoly power or of economic efficiency. The analysis in this case also raises, *inter alia*, important issues of economic interpretation for the PP studies in general.

Further, in view of (a) the increasing national and international policy significance of the nature and degree of competition in emerging markets; (b) a paucity of systematic studies of competition in these countries and (c) widely conflicting views of economists on the subject, the present paper contributes by providing new comparative international information on competition dynamics in leading DCs.[4] In addition, by comparing competition dynamics in DCs and ACs in its various aspects, the paper contributes to PP studies and to our understanding of the economics of competition in countries at different stages of development.

II. Persistence of Profitability and Intensity of Competition

Static measures of concentration inadequately reflect competition intensity since, despite high industry concentration ratios, competition between oligopolistic firms may be intense over market share, design, sales, etc. Such competitive dynamics may be better captured by examining the persistence of corporate rates of return. If competition is intense there is unlikely to be persistency in the profitability of competing firms. Those with above average profits in one period will not be expected to maintain the same level of profits in the subsequent period since they will be eroded by competitors. With less intense competition, profitability differences between firms may be more persistent.

This essentially Schumpetarian perspective on the competition process has been adopted in PP studies, which are typically based on estimation of the following first-order auto-regressive equation for corporate profitability.

$$P_{it} = \alpha_i + \lambda_i P_{it-1} + U_{it} \qquad (1)$$

where P_{it} is the profitability of firm *i* in time *t,* α_i and λ_i are the parameters to be estimated, and U_{it} is the usual error term. The coefficient λ_i is interpreted as the speed of adjustment of excess profits to the norm and, if $\lambda_i \in (-1,1)$, the equilibrium or long-run profitability level of firm $_i$ is given by:

$$P_{iLR} = \alpha_i / (1 - \lambda_i) \qquad (2)$$

As Geroski (1990) notes, (1) is best regarded as a reduced form of a more elaborate structural model involving entry, *threatened* entry and exit of firms. Since threatened entry cannot be observed, this makes it difficult to estimate the structural model.

Equation (1) has the virtue of not requiring any unobservable variables to map competitive dynamics. However, the equation does not differentiate between different sources of persistency, specifically those arising from persistent monopoly power or those due to continuous good management and hence persistent efficiency. Entry and exit forces which erode excess profits apply to both sources of such profits.

Although (1) is a simple statistical model, its coefficients, associated estimate of P_{iLR}, the variance of U_{it}, and cross-firm variation in these statistics all have economic significance for competition dynamics, as do the correlations between some of these and other relevant variables.

III. Persistence of profits in DCs: Time Series Analysis

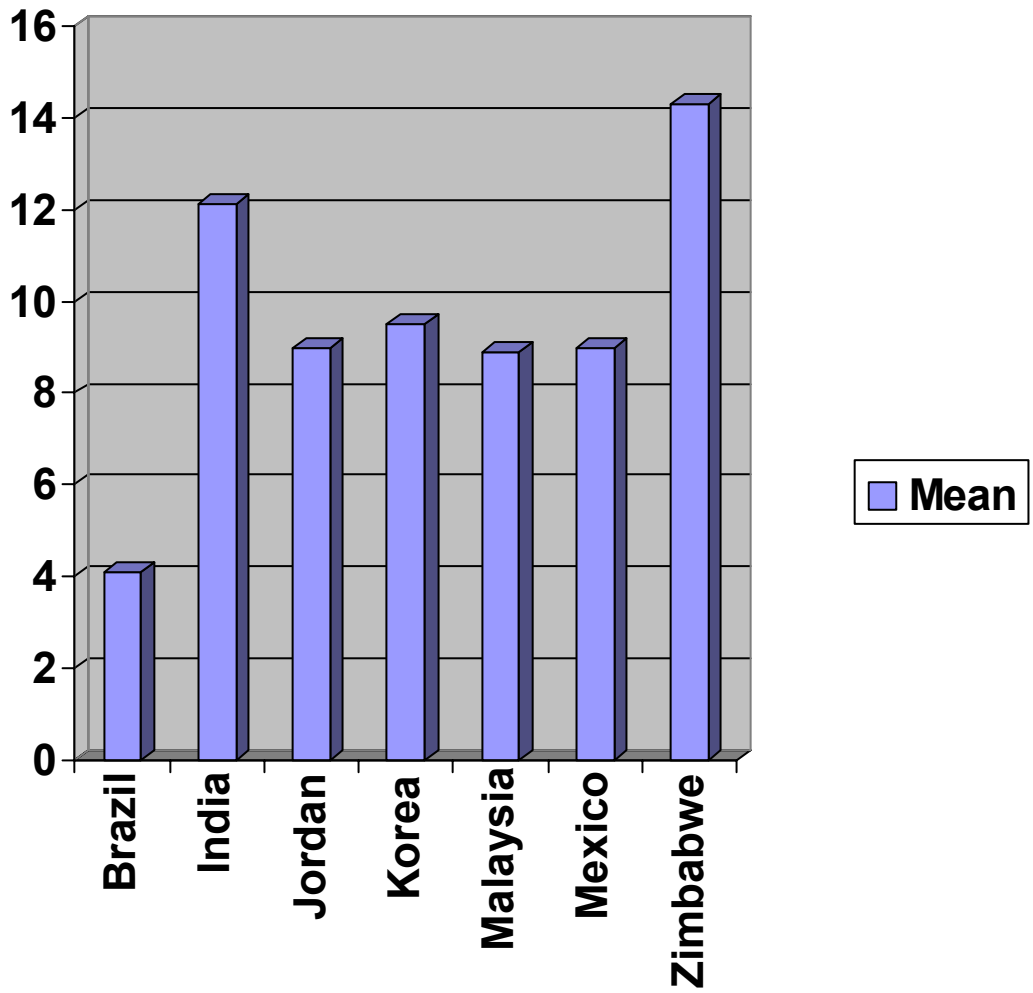
We report results from three different persistency studies: the persistence of profitability, profit margins and capital/output ratios. We first outline the statistical methodology as well as the economic issues concerned with the persistence of profitability, and then examine the persistency of the two components. As the methodology is the same for all three exercises, this will be discussed in some detail. Despite its brief methodological and economic discussions, GLS contained the full empirical results for the profitability regressions and only summary findings from that exercise will be included here.

The data set consists of accounting information on after-tax profits (*R*), total assets (*K*) and sales (*S*), which are used to generate for each firm annual time-series on profitability (*R/K*), profit margins (*R/S*) and output capital ratios (*S/K*). The sample is a subset of the largest 100 corporations quoted on the stock markets of the seven countries mentioned earlier. The subset represents those firms in each country which have a common run of data in excess of 10

observations; firms with broken runs of data are excluded on the grounds that time series methods are inapplicable with such short time series.[5]

In the profitability exercise, P_{it} is defined as earnings after tax divided by total assets. Graph 1 provides the means of corporate profitability for each country. These rates of return are similar to those reported for the larger data set by Glen, Singh and Mathias (1999).

Graph 1. *Mean Corporate Rates of Return after Tax: sample countries and firms.*



Source: Constructed from the data-base used for this paper. For details of the data-base see Section II and footnote 5.

Following the literature, the regression analysis is undertaken on the transformed profitability measures $Y_{it} = P_{it} - P_t$, where P_t is the average profitability across firms. The measure Y_{it} represents the deviation of firm i's profitability at time t from the profitability of all other firms in the country at that time. This should help to control for the business cycle and other common factors which affect all firms. The analysis is based on models of the form

$$Y_{it} = \alpha_i + \lambda_{1i} Y_{i(t-1)} + \lambda_{2i} Y_{i(t-2)} + \varepsilon_{it} \qquad (3)$$

where α_i, λ_{1i} and λ_{2i} are coefficients and the ε_{it} are random errors. The empirical analysis shows that this model is sufficient to capture the dynamics in *all* cases in our countries.

From (3), the statistic $Y_{iLR} = \alpha_i / (1-\lambda_{1i} - \lambda_{2i})$ can be derived to indicate firm i's long-term profitability relative to the country average. If $\lambda_{2i}=0$, then the estimate of λ_{1i} provides a direct measure of the speed of adjustment of profitability following a shock. Assuming $\lambda_{1i} \in (0,1)$, adjustment to equilibrium is monotonic. Where λ_{2i} is not zero or $\lambda_{1i} \in (-1, 0)$, adjustment is non-monotonic and there is no unique way of characterising its speed based on the estimated parameters. [See further Goddard and Wilson (1999)].

Testing for the presence of unit roots

The presence of a unit root, which indicates that shocks to profitability persist indefinitely, implies that (3) can be written in first difference form. Tests of the unit root hypothesis have notoriously low power and that problem is compounded in our case since we have a small number of time series observations for each firm. However, a relatively powerful test of the unit root hypothesis is provided by Im *et al.* (1997) in situations where the data under investigation also have a cross-sectional dimension. The 'standardised t-bar test' proposed by Im *et al.* exploits the panel structure of the data and is based on the average value of the Augmented Dickey-Fuller statistic calculated for each of the individual firm's data, adf_i; i.e. the average value of the t-statistic on the coefficient β_i in the rewritten version of (3) given by the Dickey-Fuller regression:

$$\Delta Y_{it} = \alpha_i + \beta_i Y_{i(t-1)} + \gamma_i \Delta Y_{i(t-1)} + \varepsilon_{it} \qquad (4)$$

where $\Delta Y_{it} = Y_{it} - Y_{i(t-1)}$ and comparing the model with (3), $\beta_i = -[1-\lambda_{1i}-\lambda_{2i}] = -[1-\lambda_i]$ and $\gamma_i = -\lambda_{2i}$. To take into account the short time series available while recognising the requirement that the ε_{it} do not display serial correlation, we

calculated two sets of tests of the unit root hypothesis in our seven countries; in the first (unrestricted) set, $\Delta Y_{i(t-1)}$ is included in all regressions while, in the second (parsimonious) set, the test is conducted on the basis of regressions chosen through a specification search in which the Schwarz-Bayesian Criterion (SBC) is calculated to decide whether or not to exclude the lagged $\Delta Y_{i,t-1}$ term. In both cases the appropriate standardised t-bar statistic is calculated and compared to the relevant critical values.

Table 1. *Persistence of profitability: Summary of results on the estimated Augmented Dickey-Fuller regressions*

	α_i	λ_i	adf_i	R_i^2	Y_{iLR}
Brazil					
Mean	-0.001 (0.005)	0.013 (0.050)	-2.743	0.418	0.003 (0.050)
St. dev.	0.071	0.345	1.009	0.187	0.060
India					
Mean	0.003 (0.003)	0.221 (0.059)	-2.180	0.326	0.000 (0.192)
St. dev.	0.052	0.433	1.187	0.255	0.062
Jordan					
Mean	0.008 (0.005)	0.348 (0.063)	-2.447	0.299	0.051 (0.099)
St. dev.	0.040	0.318	1.003	0.167	0.214
Korea					
Mean	0.001 (0.001)	0.323 (0.030)	-2.568	0.300	0.005 (0.462)
St. dev.	0.018	0.381	1.694	0.226	0.037
Malaysia					
Mean	-0.001 (0.002)	0.349 (0.037)	-2.326	0.302	0.009 (0.080)
St. dev.	0.042	0.319	1.090	0.219	0.067
Mexico					
Mean	-0.005 (0.004)	0.222 (0.056)	-2.269	0.316	-0.002 (0.238)
St. dev.	0.041	0.281	0.797	0.182	0.048
Zimbabwe					
Mean	-0.005 (0.003)	0.421 (0.042)	-2.225	0.249	0.157 (4.048)
St. dev.	0.043	0.338	1.097	0.182	0.977

*Notes.*Coefficients α_i, λ_i refer to the parameters of the Dickey-Fuller regression of (4) in the text, where $\lambda_i = \beta_i - 1$. The adf_i are the t-values associated with β_i in the same regressions, and the $\bar{R}^2_i$ also relate to these regressions. $Y_{iLR} = \alpha_i / (1-\lambda_i)$. The reported statistics refer to the distribution of the statistics across the firms within the country (Standard errors are in parentheses). The reported regressions are the outcome of a specification search in which γ_i is set equal to zero according to the SBC.

Source: Summary statistics extracted from GLS.

Table 1 reports summary results[6] for each country by estimating (4) across all firms following the specification search described above. The results indicate **first**, that the inclusion of the lagged ΔY_{it} term in the model is not required in the majority of the ADF regressions, but is required in a significant minority. In this minority, regression equations without the extra dynamics would be misspecified. **Secondly**, the fit of the regression is reasonable in most cases, with the average country R^2 lying in the range [0.25, 0.42]. The vast majority of individual regressions have R^2 in excess of 0.1.

Thirdly, the results of the unit root tests (reported in full in GLS) suggest that this hypothesis is rejected in all countries, whether we use the results obtained from the parsimonious set of equations or the unrestricted set. The panel structure of the data set allows us to infer that profitability data is stationary.

Fourth, the average values of λ_i for the seven countries are in the range [0.01,0.42], with relatively small standard errors. These results suggest that nearly all of the impact of a profitability shock dissipates within 1-4 years.

Fifth, the mean values of the Y_{iLR} estimates lie close to zero and are not statistically significant. However, the cross-sectional standard deviations show that there is considerable variability in the long-run profitability in some countries. This is because the Y_{iLR} is a ratio of estimated parameters ($\alpha_i /(1-\lambda_i)$) and estimates of λ_i close to or greater than unity can generate large (and imprecise) values of Y_{iLR}. To check on the sensitivity of the results to this problem, we have also estimated the regression models imposing the constraint $\lambda_i \in (-1,1)$. This is achieved by noting that (4) can be re-written in a Moving Average version $Y_{it} = \mu_i + u_{it}$, where $u_{it} = \lambda_{1i} u_{i(t-1)} + \lambda_{2i} u_{i(t-2)} + \varepsilon_{it}$ and where $\mu_i[1-\lambda_{1i}-\lambda_{2i}] = \alpha_i$. This model can be estimated using exact maximum likelihood methods. The results (see Table 2) are similar for the constrained and unconstrained regressions, but an inspection of the whole distribution suggests that some extreme values disappear. Given the similarity of the results, in what follows, we concentrate on the unconstrained results only.

Table 2. *DC Corporations: Mean Values of Unconstrained and Constranied λiacross Firmṣ and the Proportion of Unconstrained Regressions which are Dynamically Unstable*

	(1) Mean λ_i	(2) Mean constrained λ_i	(3) Unstable Regression
Brazil	0.013	0.025	0/56
India	0.229	0.261	1/40
Jordan	0.348	0.335	0/17
Korea	0.323	0.310	3/82
Malaysia	0.349	0.369	0/62
Mexico	0.222	0.214	0/39
Zimbabwe	0.421	0.421	1/40

Column (1) reproduces the results of Table 2 showing mean value of λi in each country. Column (2) shows the mean value of λi obtained in regression models with the constraint that the value of λi lies in the interval (-1,1). Column (3) shows the number of point estimates of λi, which lie outside the interval (-1,1), in the unconstrained regression.

Source: Derived from the data-base used in this paper. See notes to figure 1.

Section IV. Economic Interpretation of the Results and Statistical Biases

Short- and long-term persistence of profitability and its cross-sectional dispersion

A central concern of this paper is the implications of the statistical results for the comparative intensity of competition between DCs themselves and between DCs and ACs. For this purpose, further summary statistics for DCs on long term persistency (Y_{iLR}) are reported in Table 3. The corresponding (to those in Table 2 and 3) results for mature markets by other researchers have been assembled together in Tables 4 and 5, respectively. The main conclusion of GLS was that DC persistency coefficients (□i) were not greater, but generally lower than those for ACs. Results in Tables 2 and 4 (which update the coverage of GLS) confirm that conclusion.

Table 3. *Statistics on Long-Run Profitability: DC Corporations*

	(1) Mean of Y_{iLR}	(2) Positive Y_{iLR}	(3) Negative Y_{iLR}	(4) Cor (Y_{iLR}, Y_{io})
Brazil	0.003	1/56	3/56	0.099
India	0.003	2/40	4/40	0.018
Jordan	0.05	1/17	0/17	0.072
Korea	0.005	7/82	2/82	0.254
Malaysia	0.009	4/62	7/62	0.207
Mexico	-0.002	0/39	0/39	0.300
Zimbabwe	0.157	0/40	4/40	0.099

(1) Mean values of Y_{iLR}
(2) Proportion of significantly positive Y_{iLR}
(3) Proportion of significantly negative Y_{iLR}
(4) Correlation between Y_{iLR} and Y_{io}

Table 4. *Persistence of Profitability Studies for Advanced Countries: λ values*

Author	Country	Sample Period	Observations per firm	Number of firms	Sample mean (λ_i)
Geroski and Jacquemin (1988)	UK	1947-77	29	51	0.488
	France	1965-82	18	55	0.412
	Germany	1961-81	21	28	0.410
Schwalbach et.al (1989)[a]	Germany	1961-82	22	299	0.485
Mueller (1990)	US	1950-72	23	551	0.183
Cubbin and Geroski (1990)	UK	1948-77	30	243	0.482
Khemani and Shapiro (1990)	Canada	1964-82	19	129	0.425
Odagiri and Yamawaki (1990)	Japan	1964-82	19	376	0.465
Schohl (1990)[b]	Germany	1961-81	21	283	0.509
Waring (1996)[c]	US	1970-89	20	12,986	0.540
Goddard and Wilson (1999)	India	1972-1991	20	335	0.45 (0.59)*
Odagiri (forthcoming)	Japan	1983-1997	15	357	0.50 - 0.59**

Source – Goddard and Wilson (1999), except for Odagiri (forthcoming).

[a] - Based on nominal profit on capital, before tax.

[b] - Estimations are for industry groups. Estimates of λ are from a range of specifications for the persistence model, which differ across industries.

[c] - Estimate based on pooled data for 128 industry groups. The mean λ has been estimated by the present authors from the data in Table 3 of Waring (1996).

Table 5. *Statistics on Long-Run Profitability:AC Corporations*

	(1) Mean Y_{iLR}	(2) Positive Y_{iLR}	(3) Negative Y_{iLR}	(4) Cor (Y_{iLR}, Y_{io})
United Kingdom 1951-77 (243 firms)	0.108	37(15.2)	37(15.2)	0.339
United States 1950-72 (551 firms)	0.239	125(22.7)	149(27.0)	0.582
United States 1964-80 (413 firms)	-0.359	66(16.0)	137(33.2)	0.275
Sweden 1967-85 (43 firms)	-0.015	7(16.2)	8(18.6)	0.603
Canada 1968-82 (161 firms)	0.065	33(20.5)	23(14.3)	0.454
Federal Republic of Germany 1961-82 (290 firms)	0.007	53(18.3)	50 (17.2)	0.244
France 1965-82 (450 firms)	0.297	NA	NA	0.359
Japan 1964-82 (376 firms)	-0.069	62(16.5)	56(14.9)	0.305

Figures in brackets are percentages.
Source: Odagiri and Yamawaki (1990).

More specifically, the average value of λ_i for DCs, whether constrained or unconstrained, is only about 0.27 (Table 2) while that for ACs is 0.46 (Table 4), i.e. about 60% higher. Correction for small sample bias (Patterson (2000)) reduces the difference, but even the corrected average λ for DCs is still about 30% lower than the AC estimates. This difference is not only large but is at odds with the conventional wisdom.

Nevertheless, even if the short-term persistence of profits is lower in DCs than in ACs, it might still be the case that the long-term equilibrium profitability for DC firms may exceed the normal rate of profit. For example, Odagiri and Yamawaki

(1990), in their comparison of PP studies in ACs, found that while the short-term persistency for US firms for the period 1950-1972 was smaller than that for the period 1964-1980, the long-term persistency for the earlier period was greater, leading them to conclude overall that the forces of competition were stronger in the later period. In fact, the observed correlations in our sample of DCs between λ_i and Y_{iLR} (available from the authors) are quite low ranging over (0.11, 0.30). They are positive, but not statistically different from zero in five countries and are barely significant in the other two (Zimbabwe and Malaysia).

To investigate the question of comparative long-term persistence of profitability in emerging and mature markets, Tables 3 and 5 report on the distribution of Y_{iLR} as well as the proportion of individual firms for which the Y_{iLR}s are either significantly positive or negative. The two tables also provide the correlation coefficients between Y_{iLR} and Y_{i0}. (where Y_{i0} is the initial value of Y_{it}). A high correlation between Y_{iLR} and Y_{i0} indicates that firms with high initial profitability are also the ones which have high long-term profitability, suggesting long-term persistence.

Tables 3 and 5 indicate that, in general, DC firms, relative to their AC counterparts, have lower average Y_{iLR}; and there are fewer corporations in DCs than in ACs with long-term profitability significantly different from normal profitability. The correlation between Y_{iLR} and Y_{i0} is in general lower for DCs than for ACs suggesting that firms for which long-run profitability exceeded normal profitability in the former country grouping were less likely to be those which also had high initial profitability. Using the same basic ideas, the evidence contained in Table 3 suggests that among DCs, Brazil and Mexico display a relatively lower long-term persistence than Korea, Malaysia and India, as was the case with short-term persistence of profits. However, in the case of Zimbabwe, where short-term persistency was the highest, evidence suggests less long-term persistency than, for example, in Korea and Malaysia.

There is, however, one dimension for which some evidence apparently suggests that AC firms display greater intensity of competition realtive to DC firms. Odagiri and Yamawaki (1990), Odagiri (1994) and Maruyama and Odagiri (forthcoming) show that in ACs the variance of Y_{iLR} is smaller than that for Y_{io}. This is interpreted as a tendency to convergence towards a common rate of return because of competition. Our results for DCs, however, show that the variance of Y_{iLR} is not always smaller than that for Y_{i0}. The results (available from the authors) indicate that, for three countries, the standard deviation of Y_{iLR} exceeds that of Y_{io} and it is smaller for the other four countries. However, as we know from the convergence literature on economic growth (see Lee *et*

al., (1997), it is not correct to infer convergence or the lack of it from the changes in cross-sectional dispersion of firm profitability in the generally short sample periods available. This is because, in the evolution of firm profitability over time, the dispersion of profitability at any date can be high or low depending on model evolution. Thus, describing profitability by a simplified version of (3) in which $\lambda_{2I} = 0$ and $\lambda_i = \lambda$ for all *i*, where the cross-firm variance in profitability at time T, σ_T^2, is given by

$$\sigma_T^2 = \lambda_T^2 \sigma_0^2 + (1 - \lambda_T^2)\sigma_*^2 + (1 - \lambda_T^2)/(1 - \lambda^2)\tau^2$$

where σ_0^2 and σ_*^2 are cross-firm variances of profitability in the initial period of the sample and that of the deterministic element of profitability, $(\alpha/(1-\lambda)$, respectively, λ_T^2 is the squared estimate of λ at time T, and τ^2 is a measure of the typical variation of shocks to firm profitability. Even with a very long sample (where $\lambda_T^2 = 0$), comparison of σ_T^2 at the end of sample with σ_*^2, calculated using estimated values of α_i and λ, is misleading since the observed end-of-period variation accommodates the effects of stochastic variability $(\tau^2/(1-\lambda^2))$. But at shorter samples, where $\lambda_T^2 \neq 0$, the end-of-sample variation could be dominated by the value of σ_0^2 which may be small or large. Thus, it is difficult to attribute any greater strength of competition to the compression of the range of long-run profitability relative to that of initial profitability.

To sum up, on the normal interpretation of the empirical results, one would conclude that competition is more intense in DCs than in ACs as measured both by the persistence of short- and long-term profitability. Before accepting this result, we consider possible statistical biases which may render it invalid.

Statistical validity of the results

Many biases could affect the statistical analysis of data from both DCs and ACs. These may not necessarily affect the overall conclusions of the present study because the same methodology has been applied to both country groups. It is unlikely that biases such as that of survivorship and the use of accounting instead of economic rates of return would disproportionately understate DC profit persistency relative to that of ACs. With respect to the accounting data it should be noted that the samples consist of the largest publicly-listed DC corporations and therefore the quality of the accounting data is likely to be reliable. It is true that, because of higher inflation in developing countries, historic cost-accounting data may introduce more distortions for DCs than for ACs. However, for two of the most inflation-prone countries (Brazil and Mexico) data has been adjusted for inflation. Indeed, as noted in Whittington, Saporta and Singh (1997), Brazilian authorities have made pioneering

contributions to the inflation adjustment of corporate accounts. In the case of survivorship bias, there is no reason to believe *a priori* that firms excluded from the top 100 quoted companies are likely to have greater or lower persistence of profitability than the surviving firms. 'Dropouts' from the top one hundred may have persistently low profits and not just low profits. Importantly, there is no compelling reason to expect differences in this respect between ACs and DCs[7]. Of course, it must be accepted that our results may not apply to the whole population of firms, but only to the largest firms.

Similar arguments apply to the broader challenges to PP methodology which have been put forward in recent research. Goddard and Wilson (1999), for example, have suggested that the standard procedures used in PP studies tend to considerably understate the true values of λ.[8] However, as in the cases mentioned earlier, there is no reason to believe that such more serious reservations are likely to affect DCs differently from ACs.

There are, however, other biases which are specific to DCs or more likely to affect them that could account for some of the results. The most important of these is the statistical bias due to the shorter time-series available for DCs relative to ACs. The correction of this bias, as noted earlier, does not change the central conclusions of the study. Another possible source of a specific DC bias arises from the fact that the economic environment in these countries is usually more volatile than that found in ACs. However, as noted in GLS, a more volatile environment is likely to affect R^2 rather than the persistency coefficients. The coefficients in a more volatile environment would be measured with less precision, but would not be systematically higher or lower. The R^2 for DCs in the present exercise are reported in Table 1. Corresponding statistics from three ACs from Geroski and Jacquemin (1988, Table 1, page 382) confirm that these three ACs have higher average short- as well as long-term persistency of rates of return, and also a higher average R^2 than do the sample DCs.

Economic plausibility of the results

In examining economic plausibility, the first point is the one made in some detail in Singh (2002): while there are a number of structural factors in DCs which may discourage competition, there also exist many which encourage it. To illustrate, the 'sunk costs' of entry, all else being equal, are likely to be far lower in DCs than in ACs. This is partly because the nature of demand in these countries is often less sophisticated and consists of simple products. Partly it is due to poor infrastructure and the lower levels of economic integration in DCs, which make it easier for new firms to enter the market. These points are

demonstrated in Hopenhayn's (1992) model of stochastic firm growth in which entry, exit and size distribution appear as endogenous variables and in which the size of sunk costs has an important bearing on the outcomes. In that model, lower sunk costs lead to more entry, more exit, more mobility and more competition. In contrast, in ACs large corporations have created barriers to entry through advertising, patents, trademarks, etc. which raise sunk costs and inhibit competition.

A second pro-competition structural factor is the faster rate of growth of DC economies relative to ACs. Growth should lead to a faster increase in the size of the market that would attract new entry and lead to greater competition. This result does not follow from Hopenhayn (1992) since that assumes perfect competition and, in the model equilibrium, the number of firms rises proportionately with the market size. The result is, however, compatible with the further development of the Hopenhayn-type models that assumes imperfect competition in which entry is endogenous [Asplund and Nocke (2000)]. The main prediction of the model is that the rate of firm turnover is related to the size of the market. Further analysis and evidence on the interrelationship between growth and competition is provided by Odagiri (1994).

Another structural factor relates to the role of the government in DCs which is not always anti-competition. Even though many DCs did not have formal competition policies until recently, they often used measures such as price controls to limit the affects of monopolistic practices. Further, many governments organised contests for the dispensation of assistance to firms. Indeed, Amsden (2001) suggests that it is only those countries which succeeded in developing institutions which would allow governments to impose and monitor performance requirements that were successful in industrial development.[9]

A fourth structural factor concerns the existence of large conglomerate firms operating in DCs in many different industries and which may also lead to greater competition as they permit economies of scale and scope that facilitate entry and exit.[10] The catch-up possibilities and faster economic growth in these countries also encourage entry and contestability, although some may argue that the causation is the other way around.[11]

It is an empirical question how these pro- and anti-competition structural factors will affect the intensity of competition in any country at a given time. Relevant empirical evidence is very briefly reviewed below. *First*, turnover studies indicate that the entry and exit of firms in many DCs is larger than in

ACs. For example, turnover rates[12] in Chile, Korea and Taiwan are considerably higher than those observed for the US and Canada. Tybout (2000) reports that in terms of job creation and destruction, Chile and Colombia have annual average turnover rates of 27% and 25% respectively, while the corresponding rates in the US and Canada are 19% and 22% respectively. In Morocco, the annual average job turnover rate was 31%. Tybout (2000) also reports that in Korea and Taiwan, over five-year intervals, new entrants captured 33% to 44% of the market respectively compared to 10% in the US. *Second*, there is also evidence that entry-exit turnover relative to incumbent mobility is substantially more important in DCs than in ACs (Caves (1998)). *Third*, despite the statistical difficulties in accurately measuring the efficiency frontiers, available evidence does not suggest higher cross-sectional dispersion in productivity for DCs than for ACs. In his survey of manufacturing firms in DCs, Tybout (2000) concludes that DCs have healthy turn-over rates in plants and jobs, demonstrate reasonable technology dispersion and exploit scale economies effectively.

Thus, although our results may be unexpected, analysis and evidence suggest that they are economically plausible. Indeed, since this research, based on a different methodology to that of turnover studies, arrives at similar conclusions, it strengthens Tybout's thesis about competition and efficiency in at least the leading DCs. There is no presumption here that all emerging markets are alike in this respect or in others. Although there are common structural features that DCs share (such as low sunk costs) the balance between pro- and anti-competition factors can be greatly influenced by governments through their policies and interventions. This can help explain in part the differences in the intensity of competition between the developing countries themselves. The interesting study of Korea and Taiwan by Aw, Chung and Roberts (2002) makes this point eloquently. They ascribe the differences in the intensity of competition between the two countries to the relative size of the sunk costs for typical entry in these economies.

Section V. Persistence of Profit Margins and Capital-Output Ratios

In this section, we attempt to gain further insights into the sources of persistency of profits by decomposing profitability into its constituent parts: profit margins and capital-output ratios. Then, expressing these variables as deviations from country averages and assuming the time series behaviour of the variables to be characterised by a model of the form in (3), the same methodology as in Sections III and IV is employed for these two components of profitability. The results, summarised in Tables 6 and 7, and reported fully in the Appendix[13], suggest two important findings.

Table 6. *Persistence of Profit Margins: Summary Results of Time Series Analysis*

	α_i		λ_i		adf_i		$\bar{R}_i^2$		X_{iLR}	
	Mean	**Std Dev**	**Mean**	**Std Dev**	**Mean**	**Std Dev**	**Mean**	**Std Dev**	**Mean**	**Std Dev**
Brazil	0.006	0.143	-0.012	0.389	-2.664	0.868	0.405	0.179	0.004	0.128
	(0.011)		(0.051)							
	(A = 44/56, B = 55/56, C = 7/56, D = 1/56, E = 2/56)									
India	0.002	0.055	0.197	0.446	-2.740	2.859	0.340	0.251	-0.002	0.067
	(0.003)		(0.055)							
	(A = 31/40, B = 33/40, C = 2/40, D = 2/40, E = 2/40)									
Jordan	0.006	0.040	0.311	0.256	-2.835	1.295	0.335	0.184	0.000	0.054
	(0.006)		(0.062)							
	(A = 15/17, B = 17/17, C = 1/17, D = 1/17, E = 0/17)									
Korea	0.000	0.028	0.373	0.346	-2.386	1.390	0.282	0.179	-0.002	0.048
	(0.002)		(0.031)							
	(A = 66/82, B = 69/82, C = 2/82, D = 6/82, E = 5/82)									
Malaysia	0.002	0.079	0.285	0.373	-2.571	1.668	0.323	0.238	0.009	0.112
	(0.006)		(0.039)							
	(A = 48/62, B = 51/62, C = 5/62, D = 6/62, E = 0/62)									
Mexico	-0.011	0.095	0.275	0.359	-2.301	1.340	0.308	0.231	-0.012	0.104
	(0.007)		(0.053)							
	(A = 33/39, B = 32/39, C = 2/39, D = 2/39, E = 0/39)									
Zimbabwe	-0.005	0.047	0.313	0.382	-2.567	1.076	0.307	0.207	0.001	0.055
	(0.003)		(0.044)							
	(A = 27/40, B = 33/40, C = 1/40, D = 8/40, E = 0/40)									

Notes: Estimated coefficients α_i, λ_i refer to the parameters of equation (4) in the text, where $\lambda_i = \beta_i - 1$. The adf_i are the t-values associated with β_i in the same regressions, and the $\bar{R}_i^2$ also relate to these regressions. $X_{iLR} = \alpha_i/(1-\lambda_i)$. Reported statistics refer to the distribution across the firms within a country. Standard errors, in parentheses, indicate the precision with which the Means are estimated. Regressions are the outcome of a specification search in which γ_i is set equal to zero according to the SBC. "A" = number of firms for which $\gamma_i = 0$ in each country. "B" = number of firms for which $\bar{R}_i^2$ exceeds 0.1. "C" = number of firms for which X_{iLR} is significantly positive (at the 5% level) and "D" = number of firms for which X_{iLR} is significantly negative. "E" = proportion of regressions which are dynamically unstable.

Table 7. *Persistence of Capital Output Ratios: Summary of Results of Time Series Analysis*

	α_i		λ_i		adf_i		$\overline{R}_i^2$		Z_{iLR}	
	Mean	**Std Dev**	**Mean**	**Std Dev**	**Mean**	**Std Dev**	**Mean**	**Std Dev**	**Mean**	**Std Dev**
Brazil	0.000	0.304	0.180	0.409	-2.556	1.267	0.357	0.232	-0.002	0.428
	(0.022)		(0.046)							
	(A = 49/56, B = 49/56, C = 3/56, D = 3/56, E = 1/56)									
India	0.046	0.912	0.213	0.379	-2.346	1.202	0.345	0.208	-0.005	0.614
	(0.035)		(0.055)							
	(A = 26/40, B = 37/40, C = 7/40, D = 6/40, E = 1/40)									
Jordan	-0.003	0.407	0.460	0.386	-2.112	1.357	0.271	0.216	-0.607	2.083
	(0.043)	(0.059)								
	(A = 14/17, B = 13/17, C = 3/17, D = 2/17, E = 1/17)									
Korea	0.012	0.229	0.528	0.454	-1.905	1.298	0.223	0.227	0.046	1.439
	(0.012)		(0.030)							
	(A = 60/82, B = 52/82, C = 5/82, D = 9/82, E = 5/82)									
Malaysia	-0.011		0.405		-2.008		0.259		-0.071	
	(0.028)		(0.045)							
	(A = 48/62, B = 50/62, C = 6/62, D = 8/62, E = 2/62)									
Mexico	0.002	0.253	0.286	0.343	-2.077	0.853	0.295	0.180	-0.016	0.278
	(0.016)		(0.057)							
	(A = 31/39, B = 36/39, C = 1/39, D = 4/39, E = 1/39)									
Zimbabwe	0.041	0.357	0.488	0.263	-2.048	0.870	0.226	0.163	-0.180	1.270
	(0.022)		(0.040)							
	(A = 37/40, B = 31/40, C = 3/40, D = 1/40, E = 0/40)									

Notes: Estimated coefficients α_i, λ_i refer to the parameters of equation (4) in the text, where $\lambda_i = \beta_i - 1$. The adf_i are the t-values associated with β_i in the same regressions, and the $\overline{R}_i^2$ also relate to these regressions. $Z_{iLR} = \alpha_i/(1-\lambda_i)$. Reported statistics refer to the distribution across the firms within a country. Standard errors, in parentheses, indicate the precision with which the Means are estimated. Regressions are the outcome of a specification search in which γ_i is set equal to zero according to the SBC. "A" = number of firms for which $\gamma_i = 0$ in each country. "B" = number of firms for which $\overline{R}_i^2$ exceeds 0.1. "C" = number of firms for which Z_{iLR} is significantly positive (at the 5% level) and "D" = number of firms for which Z_{iLR} is significantly negative. "E" = proportion of regressions which are dynamically unstable.

First, there is strong evidence to reject the unit root hypothesis for both profit margins and capital-output ratios.[14] Thus the results for these two exercises conform to expectations from a statistical perspective. Both elements of profitability have been found to be individually stationary, as they must be, if their product is stationary. An important question, however, is whether these results are also meaningful from an economic point of view.

Second, Tables 6 and 7 indicate that the persistency coefficients are larger for the capital-output ratios than for either the profit margins or profitability. Thus the average λ values for the capital-output ratios are nearer to unity (low adjustment), but still well below unity. If profit margins (*P/S*) can be regarded as an approximate measure of monopoly power, and the capital-output ratio (*K/S*) as a similar indicator of firm efficiency, then a straightforward economic interpretation of the results would be that, if a firm enjoys a temporary economic gain through better management or efficiency improvement, it is likely to be able to persist with this advantage for a longer period than if it acquires a temporary position of monopoly power. This interpretation would be compatible with the spirit of the Demsetz hypothesis and the Chicago view of competition, but, as is explained below, it is subject to significant caveats.

It may first be objected that the inter-firm differences in capital output ratios reflect mostly technological differences between industries rather than efficiency. However, this objection may be overcome by making comparisons within the same industry. Second, and more importantly, it may be argued that because the *K/S* ratio adjusts slowly due to the relative stability of *K*, the persistency coefficients for *K/S* would be biased upwards, unrelated to efficiency. The essential point is that profits will vary due to shocks to sales and other costs. *K* as such is constant and not subject to shocks. Changes in *K* are endogenous and are undertaken to keep *K/S* ratio at its optimum level. However, this argument is undermined by two factors. *First*, even if *K* is fixed, the *K/S* ratio can still reflect efficiency. Better managerial skills in the use of existing stock could change *K/S* without changes in *K*. *Secondly*, there is an important empirical point which is relevant here, namely, that the variable *K* (the capital stock of the company) is 'proxied' by the balance sheet value of *total* assets, that is, fixed assets plus current assets. The latter, which include stocks and work in progress, trade credit, etc. can easily vary in response to shocks.

If, as a practical consequence of the point just mentioned, there were, at the margin no inherent large differences in the speeds of adjustment of *K*, *S* and *P*, then, for a particular sample of firms for a specific country, the persistency of

profit margins could legitimately be compared to the persistency of capital-output ratios because, in both cases, the industrial distribution of firms is the same. Under these assumptions, the corresponding values of λ would convey information on the relative intensity of competition forces affecting *P/S* and *K/S*. Thus, in this case, the findings from Tables 6 and 7 would be compatible with the Demsetz hypothesis - if it is taken to suggest that the normal play of market forces leads to greater persistency of efficiency rather than to the persistency of monopoly power.

Our full results also provide some evidence on the relative stability of *P*, *S* and *K*. If *K* was inherently more stable than *P* or *S*, we should expect to find for most firms, *ceteris paribus*, a greater persistency for *K/S* than for *P/S*. Although in Tables 6 and 7 for each country sample the *average* λ value for *K/S* is greater than its corresponding value for *P/S*, the detailed comparative distributions of λ values for *K/S*, *P/S* and *P/K* indicate a more complex pattern. In one third to almost one half of the individual firms, λvalues for *P/S* were greater than those for *K/S* and there was a similar overlap in the distributions of these λ values with those emanating from the time series analyses of *P/K*. Tables 6 and 7 and the underlying distributions for λ R^2 for individual firms also indicate considerable overlap for the values of this statistic emanating from the time series analyses of *K/S*, *P/S* and *P/K* respectively. This also suggests indirectly that *K/S*, compared with *P/S* and *P/K*, is not any less subject to or systematically more affected by a volatile environment. Thus the overall evidence from time series analyses does not support the view that there are inherent differences in the speed of adjustment of *P*, *K* or *S*.

However, the results on the persistency of capital-output ratios can also be given a rather different interpretation which apparently contradicts the Chicago view. This interpretation takes a dynamic view of economic efficiency and is more compatible with the basic economic framework of the PP studies. It starts with the question: What is the comparative speed of adjustment of low (capital) productivity firms to converge to the best practice, that is, the highest (capital) productivity level? To address this issue adequately, we require a model of the diffusion process by which best practice is transferred from high- to low-productivity firms. While this goes beyond the scope of the present paper, a simple stylised model of diffusion is presented in the Appendix in which it is assumed that, given a distribution of productivity achievement across firms, each firm has a best practice reference firm that is placed randomly somewhere higher in the distribution. In this case, the 'typical' reference firm will generally move in line with the average firm and the time series properties of firm capital-output ratios, each expressed relative to the mean, provide a reasonable

indicator of the diffusion process. However, a comparison in these terms for any two countries in the sample can only be made if we assume that the level of technological development and the industrial distribution of firms is the same in the countries being compared. Thus, for example, these conditions are more likely to be met in the case of Brazil and Korea than for the other sample countries. These two are leading semi-industrial countries with a large number of conglomerates in the top hundred, which is our sample frame. Coincidentally, as Table 7 indicates, Brazil and Korea also have respectively the lowest and highest values of persistency coefficients in our sample of seven countries, suggesting a faster movement towards the best practice in Brazil and a more sluggish one in Korea. However, if the persistency of capital-output ratios is viewed in terms of the continuity of good management and economic efficiency (as in the case of the Chicago interpretation above), the assessment would be reversed: Korea would be the leader and Brazil the laggard. Further analysis and evidence would be required to discriminate between these hypotheses.[15]

In considering the α coefficients and the long run values of profit margins and capital-output ratios for individual firms, denoted by X_{iLR} and Z_{iLR} respectively in Tables 6 and 7, there are similar difficulties of economic interpretation. The main issue here has already been alluded to above: is it reasonable to assume that, for individual firms, X_{iLR} and Z_{iLR} would converge to a common competitive equilibrium value, as presumed in the case of Y_{iLR} (corporate profitability)? It is important to note that the time-series methodology employed in this study does not assume that they do. The results in Tables 6 and 7 indicate that, barring a few exceptions (see statistic E), most firms converge to their own particular long-run values but not necessarily to a common equilibrium value. For the latter condition to hold, it would be necessary to make the further assumptions that competition forces all firms in long-run equilibrium to have the same best-practice capital-output ratio and analogously the same equilibrium profit margin. These assumptions are clearly unreasonable in general because of the inter-industry differences in capital-output ratios and profit margins. However, within the same industry they would appear to be no more heroic than to assume that competition forces firms in long-run equilibrium to have common rates of return. On the basis of these assumptions for the long-term analysis and the previous examination of short-term persistency, we now return to the two examples discussed above in relation to the latter. *First* with respect to the comparison of the persistency of capital-output ratios with that of profit margins, Tables 6 and 7 indicate that for five out of seven countries capital-output ratios are more persistent than profit margins in the long-run, as in the short-run. In two countries (Brazil and

Zimbabwe), long-term persistency of profit margins is greater than that of capital-output ratios, unlike in the case of short-term persistency. However, it is important to note that in none of the seven countries the mean X_{iLR} and the mean Z_{iLR} are, statistically, significantly different from zero. (See columns 9 and 10 in Tables 6 and 7.) Nevertheless, in each of the five countries referred to above, the number of firms with long-run capital-output ratios significantly greater or smaller than the norm is larger for capital-output ratios than for profit margins; though the reverse is the case for Brazil and Zimbabwe.

Second, with respect to the comparison between Brazil and Korea in relation to the long-run persistency of capital-output ratios, in neither country is the mean value of Z_{iLR} different from zero at the five per cent level. More importantly, in the case of Brazil there are a proportionately greater number of firms which permanently deviate from the norm than in the case of Korea. Provided the underlying assumptions of the exercise are valid, and the comparison between Brazil and Korea is appropriate, this suggests an opposite indication to that provided by the analysis of short-term persistency coefficients for the two countries. The difficulties of economic interpretation outlined in this section underscore the need for comparative time series analyses at an individual industry level in order to more fully understand the dynamics of competition in both emerging and mature markets. However, the data requirements of sufficiently long time series for the relevant variables for the necessary samples of firms in each industry preclude such analyses for emerging markets for the moment.

VI. Conclusion

This paper has carried out time-series analyses of corporate profitability in seven leading DCs using the common methodology of PP studies. The results indicate that both the short- and long-term persistency of corporate rates of return for these DCs are lower than those for ACs. This is a surprising result in view of the widespread belief that DCs tend to exhibit a low degree of competition. Despite this conventional wisdom, the paper suggests that there are good analytical and empirical arguments to support the view that these results are plausible, and that the normal interpretation of the negative relationship between the persistency coefficients and the intensity of competition continues to be valid for DCs as well. The paper also examines the persistence of two components of profitability - capital-output ratios and profit margins - and discusses the implications of the results for the Chicago view of competition. We have found that there is more persistency of capital-output ratios than of profit margins which, under certain assumptions, is compatible with the Demsetz position of the greater persistence of efficiency than of

monopoly power. However, other interpretations based on dynamic efficiency and the speed of adjustment to best practice technological or organisational levels are also compatible with the data. The latter are more in accord with the basic framework of PP studies.

Finally, unlike previous studies that either did not explicitly consider this question, or used less powerful statistical methods, the present paper suggests that profitability, profit margins and capital-output ratios are all level stationary.

Notes

[1] PP studies for industrial countries include Mueller's pioneering 1986 and 1990 contributions for the U.S., and those of Waring (1996) and McGahan and Porter (1999); for the UK these include Cubbin and Geroski (1987,1990) and Goddard and Wilson (1999); for Canada, Khemani and Shapiro (1990); for France, Jenny and Weber (1990); for Japan, Odagiri and Yamawaki (1990) and Maruyama and Odagiri (forthcoming); for Germany, Schwalbach and Mahmood (1990). As explained in Singh (2002), in more general terms PP studies may be regarded as a part of a larger research program on the stochastic modelling of the firm and the evolution of markets overtime.

[2] Other DC studies are Kambhampati (1995) for India and Yurtoglu (2000) for Turkey.

[3] This decomposition follows from the identity $P/K = (P/S) \times (S/K)$ where P, K and S stand for profits, capital and sales respectively.

[4] For (a), (b) and (c)see further Singh (2002).

[5] A larger data set, incorporating all the normally hundred largest corporations in 10 emerging stock markets, was used, in Glen, Singh and Mathias (1999). The three countries excluded from the current paper, on the grounds that there are too few observations are Argentina, Peru and Thailand. The basic data were originally compiled and used by Singh and Hamid (1992) and Singh (1995). See further Booth, *et al* (2001).

[6] The full results were presented in GLS .

[*] 0.45 is the usual OLS estimate and the authors suggest that this implies a true λ of around 0.59.

[**] Range of value of λi.

[7] As noted earlier, the average rate of return for both the small subset of firms used here and the larger set examined in Glen, Mathias and Singh (1999) are similar. This suggests there is unlikely to be much survivorship bias. Goddard and Wilson (1999) found similar results for their UK data sets and argue that survivorship bias is not present.

[8] For example, their own analysis of UK companies using standard procedures gives a value for λ of about 0.45 while they believe its true value is about 0.60.

[9] Japan is a prominent example. Despite government involvement and weak enforcement of competition laws, empirical evidence suggests that product market competition is no less in Japan than in the US (Odagiri, 1994).

[10] For studies of conglomerates in DCs see Khanna (2000) and Singh, Singh and Weisse (2002).

[11] See further Amsden and Singh (1994).
[12] The turnover rate is the average of entry and exit rates.

[13] To save space, the Appendix is not included here; it may be requested from the authors.
[14] Results are reported in the Appendix.
[15] It is not a matter simply of the differences between the static and dynamic views of efficiency but also involves the question of the *causes* of persistency. If persistency is due to normal barriers to entry and mobility assumed in PP studies (advertising, product differentiation, etc.) it would be difficult to accept the view that the greater persistency of capital output ratios reflects greater efficiency; However, that interpretation would be more plausible if the greater persistency is due to the difficulties of imitating (say) the best practice management organisation. Incidentally, Demsetz (1989) himself observes "Alleged barriers to entry such as advertising, vertical integration, and capital requirements all fall into the class of competitive tactics more likely to be associated with productive rivalry than unproductive monopolization" (p.205). This conception of productive rivalry versus unproductive monopolisation may not be accepted by many economists. On these issues see further Reder (1982) and Martin (1993).

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